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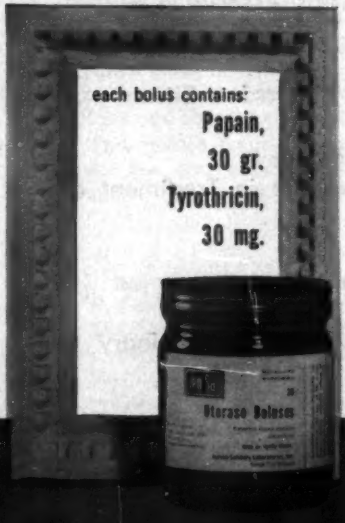

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Mucosal Disease Of Cattle†

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MUCOSAL disease is the term used to describe a cattle disease in the United States[1]. Diseases of cattle having like or similar symptomatology and pathology include virus diarrhea,[2] "red nose"[3], infectious necrotic rhinotracheitis,[4,5] malignant catarrhal fever,[6] and rinderpest[7].

Mucosal disease was first definitely diagnosed in North Dakota in January 1954. Records at the North Dakota Agricultural Experiment Station Diagnostic Laboratory indicate that this condition probably existed in North Dakota as early as 1945. To date, the disease has been definitely diagnosed on 23 farms in the state. The condition usually appears in cattle nine to 18 months of age. In several instances, it has been diagnosed in calves as young as three months of age. The highest incidence occurred from October to June, but diagnoses have been made throughout the entire year. The malady has been observed predominantly in beef cattle and has affected both sexes equally severely.

Morbidity, on the basis of typical symptomatology, has ranged from less than 1% to as high as 89%, with mortality of 100%. Recurrence has not been observed on farms after the disease has run its course. When taking herd histories, detailed consideration has been given to the possibility of contact with toxic materials. Seldom has there been any reason to suspect insect or weed sprays or any of the chlorinated napthalene preparations known to produce hyperkeratosis[8,9].

Preliminary diagnosis by ranchmen and veterinarians have included coccidiosis, A-avitaminosis, hemorrhagic septicemia, rabies, and infectious keratitis. Diarrhea, anorexia, depression, and dehydration were usually first symptoms noted by those attending affected cattle.

EDITOR'S NOTE

It is axiomatic that infectious diseases, as observed in the field, are seldom classical, or fit in every particular, textbook description. Differentiation of diseases having similar symptoms and producing similar lesions is an art acquired by clinicians through careful observations and experience. In the absence of laboratory isolation and study of etiological agents that make possible distinct differentiation, veterinarians plan treatment and control regimen on the basis of apparent pathological processes and proved experience, whenever a syndrome similar in character to a well described disease is presented.

The author draws attention to the similarity of mucosal disease and rinderpest. Symptoms and lesions appear to vary only in minor detail. It must be emphasized however, that dependence must be placed upon laboratory methods for an accurate diagnosis.

Authorities have warned practitioners often during recent years of the possibility of exotic, old-world disease, to which American cattle are probably extremely susceptible, gaining entrance through barriers set up to prevent introduction by accident or design. Practitioners must be alert to the potential hazard of spread of this disease, because of its similarity to a reportable one and which, as the author has pointed out, is increasing both in incidence and in recognition of it.

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Clinical Symptomatology
Acute Form

Close observations indicated the first symptom to be consumption of large quantities of water. At this time, body temperature is elevated and in some instances reached 107.5 F. The temperature remained high for 24 to 60 hours. No correlation has been noted between degree of temperature and severity of symptoms. During the period of elevated temperature, affected animals often approached the feeder as if hungry, but consumption was meager. Attempts at mastication appeared to be painful. Within 12 to 36 hours following temperature elevation, the following symptoms were observed: Profuse diarrhea, depression, anorexia, lacrimation, nasal discharge, and salivation.

The feces were dark in color, contained mucus and often blood. A characteristic fetid odor was always present. When primary passage was completed, straining and the intermittent elimination of small quantities of fluid material usually were observed. In some instances, diarrhea persisted until death. In the terminal stages, smaller quantities of feces were eliminated which consisted of a yellowish colored tenacious, mucus-like material. In some instances, constipation was observed. Profuse lacrimation accompanied by conjunctivitis and keratitis was always observed. Dark masses of accumulated lacrimal secretion appeared below the eye. Opacity and blindness was observed in two cases.

Salivation was intermittent, profuse, and usually frothy. Chewing movements were observed often. Examination of the oral cavity usually revealed extensive caseous, purulent deposits about the teeth and gums. A definite characteristic foul odor was always present. Ulcerations and erosions were usually observed on the dorsal and lateral tongue surfaces, hard palate, and in some instances, the gums. The conical cheek papillae often were extensively hyperemic and swollen.

In the early stages, nasal secretion is transparent and mucoid, later becoming darker and more tenacious. The nares were first hyperemic and later ulcerated and dark crusts formed on them and about the muzzle. A reddened hemorrhagic epithelium was noted when nasal crusts were removed.

Fig. 1. Symptoms of mucosal disease include depression, lacrimation, salivation, nasal discharge, crust formation about the nares and muzzle, rapid and extensive loss of weight, with a gradual development of a hyperkeratosis over the neck and shoulders.

Respiration was labored and coughing frequent. Affected animals exhibited extreme depression, but when approached became alert. Several cases exhibited encephalytic symptoms, and two were extremely aggressive and would attack anyone coming near the pens or paddock. The aggressive attitude remained until 24 to 48 hours prior to death.

Most animals moved about only when forced and exhibited a stiff gait. Movements generally appeared painful and a "walking on eggs" attitude was noted. The coronary band area was swollen and hyperemic. Interdigital ulcerations, having a mucopurulent discharge, were observed in several cases. Vulvar erosions were observed in one animal.

Animals not succumbing to this entity within two weeks of onset usually exhibited a hyperkeratotic skin condition over the neck and shoulders. This was observed frequently in animals of infected herds which had not exhibited any of the above described symptoms on the basis of history obtained from owners.

Mild Form

Field and laboratory observations indicate that numerous mild cases of mucosal disease exist. Manifestations include brief elevation of temperature (12 to 24 hours), slight nasal discharge, lacrimation, and in some instances, a diarrhea lasting about 24 hours. Anorexia was evident usually for 12 to 24 hours. Nasal mucosa was often hyperemic. A hyperkeratotic condition was noted about 2 to 3 weeks following exhibition of symptoms.

Postmortem Examination

Necropsy examination revealed no definite differential lesions or degree of pathology to exist for the acute form as compared to the mild form of this disease. In general, varying degrees of ulceration, erosion, and hemorrhage existed throughout the entire digestive tract.

Ulcerations and erosions were present usually on the lateral and dorsal areas of the tongue and on the hard and soft palate. Eccymotic hemorrhages and erosions were noted frequently in the region of the pharynx. Turbinates were always dark and hyperemic with frequent ulcerations on the anterior portions. Petechial hemorrhages often were noted in the frontal sinuses. The brain usually contained soft, dark areas and was difficult to remove from its cavity. Edema and hyperemia were constant. Large quantities of fluid were present within the ventricles of the brain. Smears made from the brain and stained with Sellers stain visualized inclusion bodies similar

Fig. 2. Hyperemic, swollen turbinates.

to those observed in positive rabies specimens. Similar bodies have been described by Stenius[10] for malignant catarrhal fever.

The esophagus often contained ulcerations and, in some instances, a gray to brown pseudomembrane which, when removed, revealed areas of ulceration. Similar membranes were noted in the trachea in some instances. Subepicardial and subendocardial hemorrhages

Fig. 3. Erosions and ulcerations of the tongue.

were observed commonly. Lungs were usually mildly edematous and frequent pneumonic lesions were observed.

In several instances, the rumen was extensively eroded and ulcerated. In the majority of cases observed, ulcerations and hemorrhages were most numerous in the abomasum, particularly in the pyloric region. The abomasal lesions were varied, with hemorrhages, erosions, or sharply circumscribed ulcers. Grossly, a halo often appeared about the ulcerated areas. Hemorrhages varied from petechial to diffuse. Frequently present were whitish, circular, raised areas surrounded by hemorrhages and having a dark, indented center. Upon pressure, a caseous material could be removed from the raised area. Erosions, ulcerations and various degrees of hemorrhages were present throughout the intestinal tract. A catarrhal or fibrinonecrotic enteritis was always present. Lesions were particularly evident in the pyloric,

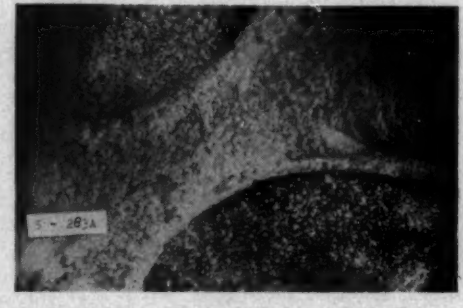

Fig. 4. Rumen. Erosion and ulceration of pillar.

ileocecal, and rectal areas. Rumen contents consisted of roughage and usually were dry. Intestinal contents consisted of a tenacious yellow mucus and extensive quantities of gas. The liver and kidney usually appeared slightly enlarged. Cholecystitis and cholangitis were always evident. The gall bladder was always enlarged and the wall thickened. Bile was dark green and tenacious. Mild cystitis was observed in several cases. Lymph nodes usually appeared soft and edematous. The hemolymph nodes were usually quite enlarged and dark red. Adipose tissue within the abdominal cavity appeared to have a pinkish-orange tone.

Fecal examinations revealed large numbers of coccidia and nematodes to be present in all cases observed.

Experimental Transmission

Attempts to transmit the disease to susceptible cattle have been carried out. Bacterial-free blood obtained from typical cases has been administered intramuscularly into

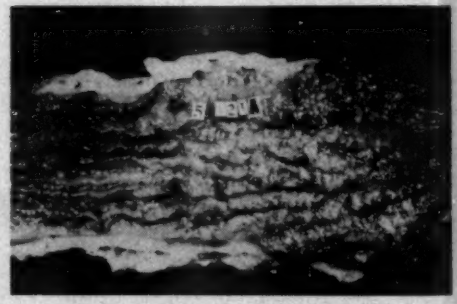

Fig. 5. Rectal section. Corrugated appearance — usually appears as a dry, friable, caseous membrane which, when removed, leaves the muscular layers exposed.

susceptible animals. Four to ten days following administration, a mild form of the disease has appeared. The mild condition has been characterized by lacrimation, salivation, nasal discharge, elevated temperature, anorexia, and mild diarrhea. The above symptoms have persisted for 12 to 36 hours. Intermittent recurrence of one or all of the above symptoms have appeared in some animals. Experimental transmission attempts to swine and sheep have not been successful. In no instance has the severe, acute form of this disease been produced experimentally.

Attempts to transmit this disease to laboratory animals thus far have failed. Laboratory animals utilized include guinea pigs, rabbits, hamsters, white mice, white rats, and young

(*Continued on page 450*)

Rumen Content In Young Calves

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THE rumino-reticular cavity of young calves is relatively non-functional at birth. It must be developed in capacity, in microbiological, and possibly other aspects before these animals can consume and digest roughage as a major component of their diets. This study was undertaken to obtain further information concerning the nature of the rumen contents, both physiologic and pathologic, early in the period of development in calves fed in various ways. The volume of the rumen contents, the presence of milk or hairballs and the pH were among items observed and efforts were made to note factors which influenced them.

Schalk and Amadon[15], using calves with rumen fistulas, observed that variable amounts of milk entered the rumino-reticular cavities when the animals drank from buckets but not when it was sucked through nipples. They pointed out that milk could not undergo normal digestion in this compartment of the stomach, and thus its use by the animal would be delayed. Later, Wise and Anderson[18] reported similar findings on calves which were slaughtered and on others observed through rumen fistulae. In their experiments, milk was seen to flow into the rumen in only 2.2% of the occasions for calves allowed to suck nipples as opposed to 36.9% for those fed directly from the pail. However, appreciable quantities of milk were seen to enter the rumen in less than half the observations in this latter group. In the one calf which tended to have milk enter the rumen in large quantities, attacks of diarrhea sometimes were associated with it.

The hairballs which sometimes form in the rumens of young calves are composed not only of hair from the animals but may also contain considerable quantities of plant fibers[17]. The observations of Bullard[2] indicate that they tend to develop at an early age as several were found in calves as young as six weeks of age. Faulty conditions of management and diet seem to be involved in their development. An example, judging by various reports[6,8] is the maintenance of calves on a diet of milk alone under which condition hairballs are prone to develop.

The hydrogen-ion concentration of rumen contents of older ruminants has been investigated on a number of different occasions and under varying conditions[3,19]. Apparently the pH normally remains fairly uniform, being seldom much below 6.0 or much above 7.0,

Fig. 1. Hair and fiber ball from rumen of young calf.

although the ration fed and the time after feeding may influence it to some extent. Rumen samples from young calves being raised on the high roughage system were found to be of similar pH[4]. However the first ones collected, at four weeks of age, were lower than those obtained during the following weeks. Figures obtained by Parrish *et al.*[13] ranged between pH 6.3 and 6.7 for calves at birth. Samples obtained between one and four weeks of age were reported by Marshall *et al.*[7] as ranging from pH 5.17 to 6.89 and from pH 5.51 to 5.60 by Kesler[6].

Experimental Procedure and Results

Fluids, Milk, and Milk Curd. All the fluids and other material that could be removed readily by stomach tube[12] were collected at

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approximately daily intervals during the first few days of age from six Jersey and eight Holstein-Friesian calves. All but two had been permitted to nurse their dams for the first three or four days. Subsequently, milk was fed using open pails at the rate of 1 lb. per day per 10 lb. body weight at birth. Alfalfa hay of fair quality and a calf starter grain mixture were available at all times. Straw was used for bedding.

On the average, similar quantities of rumen fluids were obtained from the calves of both breeds during the first few days of age. The quantities are summarized in table 1. The amount of liquid removable from Jersey calves tended to increase perceptibly between the eighth and tenth days of age and then tapered off during the next few days. Holstein calves varied from this pattern in that removable liquids tended to increase during two limited periods of a day or so between the sixth and ninth days of age and again between the tenth and 13th days of age. Following each of these periods of "flooding", or increased liquid content, the quantities of materials that could be removed easily were reduced. This was partly because the calves tended to ingest dry feeds to a greater extent and no effort was made to get any larger quantities than could be obtained readily without undue manipulations.

Two additional calves, one Jersey and one Holstein were limited to a diet of milk and their stalls were unbedded. The quantity of fluids that could be removed followed the pattern of the others except that a marked recession in removable contents was not obtained. This was believed to be due to the absence of dry feed ingestion. Both animals underwent a second flooding period at 15 days of age for the Jersey and 13 days for the Holstein.

The rumen contents removed at birth were slightly opaque and viscid but changed to a more watery consistency by the next day and the color usually became gray-brown within a week unless milk was present. The majority of samples contained limited amounts of chaff, straw, or hay by the fourth day when such materials were available to the calves. A few alfalfa hay leaves were present in one sample collected as early as eight hours after birth.

There was some milk or small particles of milk curd in eight of the 13 (60.1%) samples collected by stomach tube the day after birth. Similar materials were present in four of 16 (25%) samples collected from 16 calves between the second and ninth days of age. These calves had alfalfa hay and grain available. Milk was present in one sample and traces of milk in six others obtained from 28 calves (25%) of similar age that had only hay available. Traces of milk were present in six of 177 (3.4%) samples collected from 115 calves, between ten and 30 days of age, that were given only hay with the milk. During the same age-period milk or milk curd was observed in some of the samples taken from two of 16 calves (12.5%) that had access to both grain and hay. Milk was not present in samples taken from two calves fed milk but denied access to any dry feed or bedding during their first three weeks of life.

Milk or curd was present in the rumens of 13 other calves that were slaughtered or died by 21 days of age. Hay and grain had been withheld from 12 and the other, a visibly unhealthy calf, failed to eat any even though

TABLE 1. Ages of Young Calves and Quantities of Rumen Content Removed by Stomach Tube

Calves Fed Dry Feed	Pre-flood	Flood		Recession	
	Quan., ml. Ave. & Range	Age, days Ave. & Range	Quan., ml. Ave. & Range	Age, days Ave. & Range	Quan., ml. Ave. & Range
6 Jersey	113 (24-224)	9 (8-10)	252 (100-450)	11.2 (10-13)	37 (20-60)
8 Holstein	112 (61-266)	7 (6-9)	360 (120-900)	10 (8-11)	54 (10-90)
	Second Flood	11 (10-13)	254 (150-435)	16 (12-20)	38 (10-75)
Fed No Dry Feed					
1 Jersey	279	10	425	14	325
	Second Flood	15	475	18	300
1 Holstein	169	9	390	10	300
	Second Flood	13	500	17	325

it was provided. There also were balls composed of straw fibers and hair or clumps of shavings in the rumens of nine of the 13 calves, indicating that they had ingested the bedding materials. Unthrifty appearance and depression were commonly present to some degree.

Thus milk was present to some extent in over half the rumens of the calves during the first day of age and in approximately a quarter of them during the next eight days. During the remainder of the first month of age milk or curd was present in one in eight of the calves receiving both grain and hay and in approximately one in 30 of those restricted to hay alone for dry feed. Restricting the diet to milk alone apparently did not cause milk or curd to be present in the rumen provided bedding materials also were kept away. However, when the latter were available a tendency was noted for it to occur. The presence of milk during the first week of age did not appear to cause or to be associated with any serious health problems. After this age however, the presence of milk or curd was accompanied rather frequently by ill health of some degree.

Hair and Fiber Balls. Examination at autopsy of the rumens of 67 calves which had been subjected to various experimental procedures revealed the presence of hair and fiber balls in 15. The fibrous elements were tending to form balls and apparently were not being kept broken apart by the rumen contractions in six others. Most of the balls encountered were oval in shape and consisted of hairs from the animals matted together with coarse fibers from the straw that the calves had ingested. Some were quite firm with the fibers drawn tightly together, while others were of fairly loose construction (fig. 1). The size of the largest firm one was approximately 9 x 8 x 7 cm.

The data based on the ages of the calves have been summarized in table 2. The incidence of hair and fiber balls was decidedly the highest in the 24 calves autopsied between ten and 21 days of age. There were 12 so affected in this age group and an additional four others having a tendency for balls to form in their rumens. A check of the diets these 12 calves had received revealed that the available roughage had been limited to straw bedding in the case of seven of them and that the other five had failed to eat hay even though some was provided. These latter five were also bedded with straw. Their health was unsatisfactory for various reasons including the possibility that some were affected by the experimental diets and treatments they received.

The three calves in the older groups (22-80 days of age), shown in table 2 as having had hair and fiber balls present and the two additional ones having a tendency for them to form in their rumens, all had been denied hay for periods which extended from birth to between their 14th and 27th days of age. Straw or shavings and straw had been used for bedding. Two of these calves, one 42 and the other 49 days of age, had lesions on the ventral walls of their rumens where

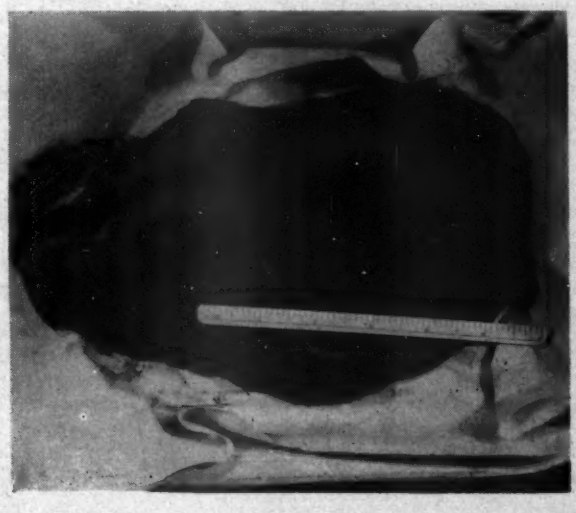

Fig. 2. Materials adhered to ventral wall of the rumen of a young calf limited to a diet of milk and bedded with straw.

Fig. 3. Squeezing effect on rumen villi produced by adhered materials and desquamating epithelial cells.

the balls and other materials in their rumens had tightly adhered to the tissues (fig. 2). The adhesion of the materials to the rumen wall had prevented the release of desquamating epithelial cells. The piling up of these cells along with the adhered materials on and between the villi had produced a squeezing effect on these structures (fig. 3).

The rumen of a 26-day-old calf that had been denied hay and bedded with shavings was packed with a mass of the latter and some were present in the omasum and abomasum. There was an actively developing abscess approximately 1.2 cm. in diameter in the anterior wall of the omasum which had apparently resulted from injuries caused by some of the sharp points on the shavings.

Hydrogen-ion Concentration. Samples from calves between one and 31 days of age were examined using a Beckman pH meter. The results are summarized in table 3. There were 45 samples which appeared to be free of milk or curd from nine calves between one and ten days of age. The readings obtained ranged between pH 5.97 and pH 7.60, and averaged pH 6.83. Four samples which had milk or curd in them were from three calves between three and eight days of age and were pH 6.27, 5.65, 5.34, and 4.43. The latter sample was mostly curds and whey in appearance. The reading obtained on a sample from a nine-day-old calf which had received a rumen infusion the day before of 600 ml. of milk was pH 7.08. In appearance there was little milk present in the sample. No adverse effect seemed to be suffered by the calf from this or two further rumen infusions of milk. Four samples from two calves between 11 and 25 days of age which were on diets of milk alone were found to be pH 6.29, 6.51, 6.57, and 6.63 — an average of pH 6.50. Samples were checked from six calves between 11 and 31 days of age that had access to hay and grain free choice. The average of the 25 samples was fairly close to the previous four being pH 6.69.

TABLE 2. The Incidence of Hair and Fiber Balls in the Rumens of the Young Calves

Age Groups (days)	No. calves Autopsied	No. with Hair and Fiber Balls	No. with Tendency to Form	% Affected
Under 10 (3,5, & 6 Days)	3	0	0	0
10-21	24	12	4	66.6
22-42	16	2	2	25.0
43-80	24	1	0	4.2
Total	67	15	6	31.3

Discussion

One might suspect the saliva as being the source of the liquids involved in the early flooding of the rumens of young calves in as much as emphasis has been placed on the tremendous quantities secreted by cattle. Saliva has considerable buffering capacity[9], yet examinations of the rumen liquids from some of our young calves which were denied water or access to roughage failed to demonstrate the presence of any marked buffering capacity in them. It would appear, therefore, that the rumen walls were more likely the source of these secretions. This might be considered as evidence which would support the statement by Nichols,[11] which is not in agreement with others,[9] that appreciable quantities of liquids come from the walls of the rumen.

The increases in the quantity of liquid which could be removed from the rumino-reticular cavities of calves at an early age appears to be in agreement with the observations of Kesler *et al.*[6] who noted a marked increase in the weight of the rumen contents of calves between eight and 16 days of age. The comparative regularity of the increases would seem to indicate that they occurred for a purpose. An explanation that suggests itself is that it may be a means for stimulating ingestion of roughage and other dry feeds.

Ingestion of roughage is followed by regurgitation and rumination and this activity may provide a mechanism for assisting in the removal of rumen liquids. Support for this explanation is provided by the observation that the weights of rumen contents in young calves were greater on diets of milk alone than when dry feeds were ingested[6]. We have noticed frequently that the rumens in both calves and older cattle either denied dry feeds or unable to eat them fill up with liquid. Partial removal of the liquid by stomach tube is followed sometimes by actions indicating the animal feels better. Perhaps it is the excessive liquid nature of the rumen contents that stimulates the aggressive manner in which cattle sometimes go after fibrous roughages when their diet is limited in this respect, for example cows on lush legume pasture.

Open pail feeding has been suggested as a factor in the passage of milk into the rumen[15,16]. Milk was present in samples from the rumino-reticular cavities of calves between one and four days of age even while they were nursing their dams. Thus any suspicion that pail feeding was the major influence for milk entering these cavities at this early age could be ruled out in these cases. Then again, pail feeding as a serious cause of milk entering the rumen may be questioned because there was but a low incidence of milk or curd in the rumens of the 115 calves which were fed milk from open pails along with nothing but fairly good quality alfalfa hay. Some relationship of this condition with factors which promote a lower state of health may be indicated by the greater incidence in calves; (1) with rumen fistulas[15,18], (2) those provided with both good quality hay and high protein grain free choice, a diet that was associated with a rather high incidence of diarrhea[14] and, (3) the abnormal conditions in the rumens of calves on an experimental milk substitute diet[6]. In line with this thought, the abnormal figure of pH 4.43 was obtained on a rumino-reticular sample containing curd and whey-like fluid and similar figures accompanied by abnormally sour odors were obtained by others[6]. This would suggest that the origin of the curd and some of the liquids was the abomasum. Support is given this suggestion by the fact that milk placed in the rumen of a healthy calf did not remain there and ferment. It would seem reasonable that in conditions of gastritis the curds, whey, and other materials in the abomasum would tend to be vomited in similar manner to some single-stomached animals. However, in the case of calves, the vomitus would stop in the rumen. Thus, curd in the rumen possibly may not be the cause but the effect of an abnormal gastric condition of the animal.

Some idea of how soon suitable dry feeds apparently should be provided can be obtained from the observation that calves of but a few days of age had picked up bits of roughage, a finding which is in agreement with others[1]. The early formation of hair and fiber balls from undesirable materials such as bedding further emphasizes the need for early provision of suitable roughage and that care be taken to prevent ingestion of wrong materials. In this latter regard the possibility of injury to the digestive tract from shavings when ingested indicates that this may not be a satisfactory bedding material when other roughage is being limited. The indication that ingestion of hay may play a part in limiting the presence of milk and curd in rumens is another point worthy of mention. If it is desirable that calves reach maximum rumen capacity and microbiological development at an early age then the feeding of adequate roughage has a further advantage because rumen development was found to be twice as great by 16 weeks of age on a hay diet as on one consisting of grain concentrates[16].

Summary

The quantity of liquid removable by stomach tube from the rumens of young Jersey calves tended to increase perceptibly between the eighth and tenth days of age and then tapered off. Holstein calves varied from this pattern as the increase occurred on two occasions once

TABLE 3. pH of Samples of Rumen Content from Young Calves

No. Samples	No. Calves	Age (days)	Condition	Range pH	Average pH
45	9	1-10	Free of milk	5.97-7.60	6.83
4	3	3- 8	Milk or curd present	4.43-6.27	5.42
1	1	9	Milk infusion 24 hrs. before	— —	7.08
4	2	11-25	Diet: milk alone	6.29-6.63	6.50
24	6	11-31	Diet: milk, hay and grain available	5.73-7.53	6.69

between the sixth and ninth and again between the tenth and 13th days of age.

Milk was present to some extent in the rumens of over half the calves during the first day of age and in approximately a quarter of them during the next eight days. During the remainder of the first month milk or curd was present in one in eight of the calves receiving both grain and hay and in approximately one in 30 of those restricted to hay alone for dry feed.

The incidence of hair and fiber balls in calves between ten and 21 days of age was greater than in either younger or older calves.

The pH of rumen contents free of milk from calves between one and ten days of age ranged between 5.97 and 7.60 and averaged 6.83. Those with milk or curd present ranged between 4.43 and 6.27. Samples collected from calves between 11 and 25 days old on milk alone averaged pH 6.50 and from calves of almost similar age but receiving grain and hay free choice was pH 6.69.

The significance of these findings is discussed in relation to calf health problems and the normal development of the young ruminant.

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▼ ▼ ▼

Curled Tongue in Turkey Poults

Observation and experimental work conducted in England and reported by Wright and Temperton (*The Vet. Rec.*, 67:510 [July 2], 1955), lead to the following conclusions:

"(1) The primary cause of a curled tongue condition in turkey poults is through feeding all-mash diets of fine physical consistency in a dry state during the first few weeks of life.

"(2) The visual appearance and the texture of a mash is an unreliable guide to its suitability for feeding in a dry condition to turkey chicks.

"(3) The results of these and other trials indicate that when 70% or more of the weight of a mash is comprised of particles below 1 mm. in diameter, it is liable to give rise to curled tongue when fed in a dry condition to young turkey poults.

"(4) A very high rate of recovery from curled tongue occurs when the diet is changed from dry to wet mash.

"(5) There is no evidence that inherent factors, the nature of the maternal diet or the chemical constitution of the turkey starter diet has any effect on the incidence of curled tongue."

▼ ▼ ▼

Statisticians at the University of Minnesota estimate that research on diseases of chickens and turkeys at that institution has put an additional $2,000,000. a year into the pockets of poultrymen.

Activity Of Combined Penicillin, Dihydrostreptomycin, Neomycin And Sulfisoxazole Against Microorganisms Associated With Mastitis

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CONSIDERABLE information is now available concerning the effects of various antibacterial agents on microorganisms of etiologic significance in bovine mastitis. Of the antibiotics, penicillin is especially active against Gram-positive bacteria, and the efficacy of this drug has been well established in the treatment of bovine mastitis caused by streptococci and, to a lesser extent, by staphylococci[1-4]. Streptomycin, which possesses preferential activity against Gram-negative organisms, has proved most effective in coliform mastitis[5-7]. While having no apparent therapeutic value for staphylococcic mastitis, recent work[8] revealed that streptomycin, as well as its hydrogenated derivative, dihydrostreptomycin, may be as effective as penicillin in mastitis caused by *Streptococcus agalactiae*. Neomycin, active against many of the common Gram-positive and Gram-negative bacteria, has been reported effective in mastitis due to streptococci, staphylococci, coliform bacteria, Pseudomonas, and yeast[9].

Sulfonamides are still widely used in the treatment of mastitis. Experimental and clinical studies with sulfisoxazole, one of the newer members of the sulfonamide group, have indicated possible value of this drug in udder infections. Although rapidly excreted following parenteral administration,[10,11] sulfisoxazole possesses antibacterial properties comparable to commonly employed sulfonamides[12]. The drug is characterized by low toxicity and a high solubility within the physiologically important range of pH 6.0-7.5,[13] which would favor local use of this sulfonamide.

Recognition of the limitations of different chemotherapeutic agents administered singly has prompted numerous investigations of the potentialities of combined therapy in mastitis. *In vitro* and *in vivo* studies have indicated that various sulfonamides, including sulfisoxazole, may act in synergism with penicillin and streptomycin[14,15]. It is noteworthy that sulfonamides, in combination with penicillin, have given better results following infusion therapy than with either sufonamide or penicillin administered separately[16]. Combinations of penicillin and streptomycin have been found effective in cases in which both *Streptococcus agalactiae* and *Staphylococcus aureus* existed[17]. Mixed therapy with dihydrostreptomycin and penicillin also has proved successful in mastitis presenting concurrent infection with streptococci, staphylococci, and coliform bacteria[18], and the use of this combination has been encouraged in cases of acute mastitis in which the etiology is not apparent[19].

In search of an intramammary preparation possessing broad antibacterial action, the above facts suggested clinical use of a combination of antibiotics with a sulfonamide. A product formulated consisted of the following agents in peanut oil containing 3% aluminum monostearate: Procaine penicillin G, 100,000 units*; dihydrostreptomycin (as sulfate), 100 mg.; neomycin (as sulfate), 100 mg.; and sulfisoxazole, 375 mg.; each contained in an applicator tube of 7.5 cc.

The present report deals primarily with the *in vitro* activity of the above preparation against bacteria commonly involved in mastitis. Realizing that the *in vivo* manifestation of sensitivity to antibacterial agents is dependent upon certain conditions not duplicable in the test tube, an attempt was made to simulate, as far as possible, the actual udder environment. To this end all tests were performed in whole

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*The procaine penicillin G content has since been increased to 750,000 units per 7.5 cc. in the product known as Bovamycin, trade name of Pitman-Moore Company, Division of Allied Laboratories, Inc., Indianapolis, Ind.

milk rather than in the generally employed infusion and peptone media.

Experimental

The following organisms were selected for the study: *Staphylococcus aureus, Streptococcus agalactiae, Aerobacter aerogenes, Escherichia coli* and *Pseudomonas aeruginosa.* Tests were made in accordance with a serial dilution technic. Fresh homogenized whole milk, sterilized in the autoclave, was employed as the test medium. The contents of seven tubes of the preparation were expressed and mixed together under aseptic conditions. An initial dilution of 1:2 was prepared by adding 5 cc. of the composite to a test tube containing an equal amount of the sterile milk. This was further diluted in twofold steps in milk through a total of 20 tubes. Seven such series were set up. Each serial tube contained a final volume of 5 cc. of milk plus the product at the various dilutions. The inoculum was 0.1 cc. of a 1:10,000 dilution in milk of an 18-hour culture of test organism grown in brain-heart infusion broth (Difco). In addition to testing each organism singly, a series was inoculated similarly with a mixture of all five strains. Although preliminary sterility tests on the product were negative, the remaining dilution series was included, uninoculated, as a further control. All tubes were incubated at 37 C. After 24 hours, any visible changes in the tubes were noted and each was subcultured into brain-heart infusion broth, and onto blood agar and desoxycholate agar for detection of the presence of the Gram-positive and Gram-negative organisms, respectively. Gram-stains of subculture growth also were prepared for confirmation of endpoints. Subculturing was repeated after 48 hours incubation and the serial tubes were allowed to incubate for an additional three days.

Results

Results are summarized in the accompanying table. In terms of actual dilution of the product *per se,* one part of the ointment in 512 parts of whole milk was capable of killing the most resistant of the organisms tested, *i.e., Ps. aeruginosa.* This dilution would contain, therefore, 26.04 units of procaine penicillin per cc., 26.04 mcg. per cc. each of dihydrostreptomycin and neomycin, and 9.77 mg. % of sulfisoxazole. The strain of *Staph. aureus* proved to be the most sensitive of the organisms as indicated by negative subcultures from milk containing a 1:1,048,576 dilution of the product. Unfortunately, the serial dilutions were not extended far enough to obtain an exact endpoint for this organism. As might be expected from results occurring with the individual species, the bactericidal dilution for the mixed culture coincided with that obtained for *Ps. aeruginosa.*

Incubation of tubes beyond the first 24 hours did not result in any differences in endpoints as recorded in the table. Subcultures were negative for each of the tubes in the uninoculated drug-control series.

TABLE 1. In Vitro Activity of Antibiotic-Sulfonamide Combination

Tube No.	Dilution of Product	Growth in Milk as Determined by Subculture					
		Staph. aureus	Strep. agalactiae	A. aerogenes	E. coli	Ps. aeruginosa	Mixed culture
1	1:2	0	0	0	0	0	0
2	1:4	0	0	0	0	0	0
3	1:8	0	0	0	0	0	0
4	1:16	0	0	0	0	0	0
5	1:32	0	0	0	0	0	0
6	1:64	0	0	0	0	0	0
7	1:128	0	0	0	0	0	0
8	1:256	0	0	0	0	0	0
9	1:512	0	0	0	0	0	0
10	1:1024	0	0	0	0	+	+
11	1:2048	0	0	0	+	+	+
12	1:4096	0	0	0	+	+	+
13	1:8192	0	0	+	+	+	+
14	1:16,384	0	0	+	+	+	+
15	1:32,768	0	0	+	+	+	+
16	1:65,536	0	0	+	+	+	+
17	1:131,072	0	0	+	+	+	+
18	1:262,144	0	0	+	+	+	+
19	1:524,288	0	0	+	+	+	+
20	1:1,048,576	0	+	+	+	+	+

0=no growth (bactericidal); +=growth.

Discussion

The broad, antibacterial range covered by the antibiotic-sulfonamide mixture described should make it ideal for treatment of mastitis. The bactericidal endpoints manifested in the presence of milk would indicate high activity of the combination in the udder environment, especially in the lower levels of the milk ducts and cistern. It should be realized, however, that maximum efficacy of any chemotherapeutic preparation, regardless of potency, will depend on the pathological state of the udder at the time of application.

Of particular significance is the fact that the three antibiotics selected belong to a group the members of which frequently show synergism with one another and apparently no antagonism[20]. *In vitro* studies have shown that mixtures of penicillin and streptomycin not only possess enhanced antibacterial properties but with the further addition of sulfonamides the appearance of resistant strains may be delayed, especially in infections caused by certain Gram-negative bacteria[21-26].

Since Pseudomonas infection of the udder has been particularly resistant to known therapeutic measures, the use of neomycin in conjunction with penicillin and streptomycin should prove advantageous in treatment of this form of mastitis. *Ps. aeruginosa* is not only susceptible to neomycin but apparent potentiation of activity has been demonstrated against this organism with mixtures of penicillin and streptomycin[24].

Clinical reports[25,26] have indicated a high degree of efficacy of the above antibiotic-sulfonamide combination in bovine mastitis. The preparation has been found especially effective in cases caused by streptococci other than *Strep. agalactiae*.

Summary

1. An intramammary medication consisting of procaine penicillin, dihydrostreptomycin, neomycin, and sulfisoxazole is described.

2. Results of *in vitro* tests performed in whole milk indicate a potentially high activity of the combination in the udder environment.

3. The wide range of activity possessed by the antibiotic-sulfonamide mixture should make it ideal for the treatment of infectious mastitis of varied etiology.

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(*Continued on page 478*)

Observations On The Anthelmintic Effect Of Piperazine Citrate In Chickens

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THE anthelmintic value of piperazine compounds has been verified by several workers in both man and animals[1,2,3,4,5,6]. Shumard and Eveleth[7] recently have reported favorable results against two common nematodes (*Ascaridia galli* and *Heterakis gallinae*) in laying hens.

Historically, piperazine was introduced into medicine because of its solvent action on uric acid *in vitro*[8]. This property led to the belief that it would exert a similar activity *in vivo* and thus prove useful in the treatment of uric acid calculi and gout. Although the drug was used clinically for several years, it fell into disuse after 1917, when Hanzlik[8] demonstrated that, in doses used (0.3-0.6 gm.) it did not improve the solvent power of urine for uric acid.

The first use of a piperazine derivative as an anthelmintic was in 1947 when Hewitt *et al.*[1] revealed that diethyl-carbamyl-methyl-piperazine caused a disappearance of microfilariae from the peripheral blood when administered to human beings suffering from filariasis. In employing the same piperazine compound for filariasis treatment, Gaillard and Mille[2] observed that intestinal ascarids were eradicated when harbored by their patients.

Mouriquand, Roman, and Coisnard[3] demonstrated the efficacy of piperazine hydrate in eradication of pinworms from man; Turpin, Cavier, and Savaton-Pillet[10] described similar activity for the diphenyl acetate derivative. White and Standen[11] and White[12] have more recently confirmed the value of piperazine for use in human medicine. Several commercial preparations of the drug are marketed as human anthelmintics at the present time.

The data reported here are the results of two field trials, where a water-soluble piperazine compound was administered to broiler chickens.

Materials and Methods

Two commercial broiler flocks, containing approximately 15,600 (flock A) and 17,900 (flock B) chickens, respectively, were secured for use in the field trial. Each flock was contained in one house, being divided into two pens of approximately equal numbers. Thus, one pen in each house was designated as "controls" and the other as "experimental."

The management practices employed by the grower suggested the possibility of helminth infection in the flocks since a "built-up" litter program was used. This procedure consists of litter from the previous flock being covered with approximately four inches of new material (pine shavings) prior to introduction of new inhabitants into the house. This practice is common in broiler production, but it offers the chickens exposure to large numbers of helminth eggs. Confirmation of moderate to heavy nematode infections in the flocks was determined by autopsy.

The drug solution employed contained 400 mg. of piperazine citrate per cc. Administration was by way of the drinking water, directly into an automatic watering system. In both cases, water consumption was measured for 24 hours prior to administration (table 1). At eight weeks of age, flock A was medicated at the rate of 20 cc. per gallon of water for 60 hours. The flock consumed 750 gallons during the treatment period, each gallon containing 8,000 mg. of piperazine. Flock B was treated at six weeks of age at the rate of 15 cc. per gallon of water for 24 hours. The flock consumed 350 gallons which contained 6,000 mg. of piperazine per gallon. The control flock A was not treated with an anthelmintic prior to slaughter; flock B controls were treated with nicotine sulfate in the feed (2 lb. 0.11% product per 100 lb.) for 24 hours. This information is summarized in table 1.

Flock A was slaughtered at 11 weeks of age and flock B at ten weeks, three days.

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Acknowledgment is made to E. R. Squibb and Sons, New York, for supplying the piperazine compound.

A random sample of 50 intestinal tracts was obtained from each group of flock A; 200 such organs were obtained from each group of flock B. The organs were searched and the total number of immature (one and one-half inches or less) and mature (over one and one-half inches in length) helminths counted. The average values of worms per bird were calculated and are presented in table 2.

Results

The experimental flocks were found to consume the medicated water without hesitation. Feed intake remained at a high level, with no noticeable decrease during the time of treatment.

The autopsy data on flocks A and B are presented in table 2.

Discussion

The results of these field trials indicate a considerable degree of efficacy for piperazine citrate against *A. galli*. This organism is considered to be one of the most important helminth parasites in broiler enterprises.

In view of the apparent anthelmintic properties, the route of medication is of significance. For instance, sick chickens will drink water when they will not eat. Hence, a bird suffering from parasitism due to *A. galli* would be inclined to drink an anthelmintic while refusing one offered in feed.

TABLE 1. Flock Data

Description	Number (approx.)	Age at treatment	Treatment	Age at slaughter	Water consumption (gallons) Prior to treatment (gal./24 hrs.)	Water consumption (gallons) During treatment
A-experimental	7600	8 wk.	Piperazine (60 hrs.-20 cc./gal.)	11 weeks	300	750
A-control	8000	.....	None	11 weeks		
B-experimental	8900	6 wk.	Piperazine (24 hours.-15 cc./gal.)	10 weeks 3 days	350	350
B-control	9000	6 wk.	Nicotine sulfate (24 hrs. in feed)	10 weeks 3 days		

Autopsy results on the experimental flock A revealed the absence of adult ascarids and the occurrence of 0.24 immature *Ascaridia galli* per bird. Control flock A carried an average of 6.82 mature and 2.42 immature *A. galli* each. The average body weights at time of slaughter were 3.10 lb. for experimental A and 2.82 lb. for control A.

Experimental flock B was found to contain 0.14 mature and 0.85 immature *A. galli* per bird; control flock B contained 2.53 mature and 2.44 immature *A. galli* each. The average body weights were 2.98 lb. for experimental B and 2.94 lb. for control B.

TABLE 2. Autopsy Results

Flock	Number of intestines	Helminths recovered (*Ascaridia galli*) Per Bird Immat.	Per Bird Mat.	Totals Immat.	Totals Mat.	Wt. at autopsy (average lb.)
A-experimental	50	0.24	0	12	0	3.10
A-control	50	2.42	6.84	121	341	2.81
B-experimental	200	0.85	0.14	170	28	2.98
B-control	200	2.44	2.53	506	488	2.94

It is felt that more attention should be directed toward the dosage schedule of this preparation. The drug is apparently well tolerated, and is reported to have a low toxicity. Sloan *et al.*[6] administered what was considered to be ten times the therapeutic dose of piperazine adipate to 12-week-old chickens and observed only a short period (three hours) of anorexia and lethargy with full recovery in five hours after treatment.

From the practical view of poultry producers, a 24-hour treatment time may be desirable. The low toxicity of the product may, therefore, allow more concentrated dosage over a short period.

Summary

Results of field trials of piperazine citrate as a poultry anthelmintic are reported.

The product shows a considerable degree of anthelmintic value with no noticeable alteration of feed and water consumption. One flock, treated at eight weeks of age with 8,000 mg. of piperazine per gallon of drinking water for 60 hours, contained 0.24 immature *A. galli* per bird when slaughtered. A second flock,

given a smaller dose (6,000 mg. per gallon for 24 hours) at six weeks of age, contained 0.85 immature and 0.14 mature *A. galli* each, when killed for market.

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Clinical Reports on a New Local Anesthetic

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Xylocaine®[1], a local and topical anesthetic recently introduced to the veterinary profession, was synthesized originally by Lofgren[1] in Sweden and has been used widely by the medical and dental professions both in Europe and in this country[2,4]. The reasons for the popular acceptance of xylocaine have been its superior activity as exemplified by early onset, dependable anesthesia of longer duration and lack of toxicity whether used as a local or topical anesthetic[4,6]. In addition, it is reported to excel all known anesthetic agents in regard to stability[7].

Crawford found that xylocaine compared favorably in all respects with procaine, and other local anesthetic agents in his experimental and clinical evaluations (table 1).

We have used this new agent routinely in our large animal practice during the past year. Table 2 briefly summarizes our results.

Supernumerary teats (cases 1-18) were infiltrated routinely with a 2 cc. dosage at one site. Teats were removed by scalpel or emasculatome. A portion of the glandular tissue was removed to avoid fistulization upon healing. Interrupted no. 3 chromic catgut sutures were used only in cases 19 and 20. Restraint for surgery on the teats or udder was effected by elevating the opposite rear leg. Superficial tissues in udder lacerations were sutured with no. 1 chromic catgut. Healing was by first intention. There was no loss in milk production, nor evidence of mastitis.

TABLE 1. Comparative Rating* of Local Anesthetics

Local Anesthetic Agent	Latency Period	Stability	Topical Effect	Profoundness of Anesthesia	Toxicity
Xylocaine	1	1	1	1	2
Cyclaine ®[3]	2	4	2	2	3
Pravocaine ®[3]	3	2	3	3-4	4
Procaine	4	3	4	3-4	1

*Comparative efficiency rating (1 to 4).

Xylocaine was infiltrated along the operative sites in all cases of cesarean section and rumenotomy. The left flank is our preferred site for bovine cesarean section. A ventral midline incision was used in ewes. The onset and duration of anesthesia in both species surpassed our previous results with procaine.

Anesthesia was produced in corn removal (cases 55-57) and claw amputations (cases 23-33) by infiltration around the coronary band and the interdigital space. Anesthesia was good with little or no evidence of sensation during the operation. Claws were removed with a Benesch saw.

Cornual nerve blocks (cases 61-90)) were made with only 4 cc. of 2% xylocaine. Anesthesia was extremely rapid and intense as evidenced by occasional sagging of the eyelids. Horns were removed with a dehorning saw or a Keystone dehorner. Case 91 was a blind bull weighing 1,700 lb. with large horns diffi-

®[1]Astra Pharmaceutical Products, Inc., Worcester, Mass.

®[2]Sharp and Dohme, Inc., Philadelphia, Pa.

cult to remove. The volume injected was increased to 7 cc. as an insurance measure.

Case 93 was a cow which had aborted two weeks before term and had a severe prolapsed cervix. Seven cc. of 2% xylocaine plus epinephrine was administered epidurally prior to replacing the cervix. Retaining sutures then were inserted and recovery was uneventful.

Following the routine use of the new anesthetic agent in our practice, it is our impression that: (1) The 2% concentration of xylocaine is preferable to the 0.5% for nerve block and topical application. Little difference was noted between the two concentrations for infiltration purposes.

(2) The rate of diffusion and area anesthetized from each site of injection is better than that shown by procaine or other agents previously used.

(3) The onset of anesthesia is so rapid that our surgical procedure could begin without the usual delay for anesthesia to take effect. This unique feature is the greatest asset for an agent of this type in our practice.

(4) The intensity, and duration of anesthesia as well as the volume required compares favorably with other anesthetics.

(5) There is no evidence of toxicity due to xylocaine when used routinely as recommended.

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Ohio researchers report no boost in gain from steers fed stilbestrol when no protein supplement was fed. Cost of gains were reduced when ample protein was supplemented with stilbestrol over those from steers fed equal quantities of the protein as soybean oil meal not supplemented with the synthetic estrogen.

TABLE 2. Report of 92 Clinical Cases of Xylocaine Use

Case No.	No. Operated	Animal	Indication	Route	%	Solution Epinephrine	Volume (cc.)
1-4	4	Calves	Supernumeray Teat Operations	Infiltration	0.5	—	2
5-8	4	Calves	Supernumerary Teat Operations	Infiltration	0.5	+	2
9-13	5	Calves	Supernumerary Teat Operations	Infiltration	2.0	—	2
14-18	5	Calves	Supernumerary Teat Operations	Infiltration	2.0	+	2
19-20	2	Cows (dry)	Supernumerary Teat Operations	Infiltration	2.0	+	3
21-22	2	Cows	Removal Wart (Teat)	Infiltration	2.0	+	1
23-33	11	Cows	Claw Amputation	Infiltration	2.0	+	20-25
34	1	Cow	Udder Laceration	Infiltration	0.5	+	10
35	1	Cow	Udder Laceration	Topically	2.0	+	15 (Ointment)
36-37	2	Ewes	Cesarean section	Infiltration	2.0	+	20
38-42	5	Cows	Cesarean section	Infiltration	2.0	+	40-50
43-54	12	Cows	Rumenotomy	Infiltration	2.0	+	30-50
55-56	2	Cows	Corn Removal	Infiltration	2.0	+	10
57	1	Bull	Corn Removal	Infiltration	2.0	+	15
58-60	3	Calves	Tongue resection	Infiltration	2.0	+	10-25
61-75	15	Bovine	Dehorning	Nerve Block	2.0	+	4
76-90	15	Bovine	Dehorning	Nerve Block	2.0	—	4
91	1	Bull	Dehorning	Nerve Block	2.0	+	7
92	1	Cow	Prolapsed cervix	Epidural	2.0	+	7

Tetracycline Therapy Of Shipping Fever In Cattle, Swine, And Sheep

W. P. JOHNSON,* D.V.M., H. E. GOUGE,* D.V.M., and M. C. ALSON,** D.V.M.

MORTALITY and morbidity losses from the so-called "shipping fever complex" were long accepted as a natural hazard of the livestock industry. For many years, species of Pasteurella have been considered primarily responsible, however, usually when triggered by some stress factor which decreased the resistance of the animal[1-5]. Various sulfonamides and antibiotics have proved highly effective in treatment, and are widely used[3,4-7].

This is a report on the efficacy of tetracycline† in the treatment of shipping fever in cattle, swine, and sheep.

Procedure

Tetracycline hydrochloride crystalline, in dried form, was reconstituted with water for injection, with a final concentration of 50 mg. tetracycline per cc., and mixed by gentle swirling. In all cases, it was injected deep in the muscle at the medial aspect of the thigh, in a single daily dose of 2 mg. per lb. of body weight. Temperatures of all animals were recorded daily, and observations made as to general appearance, activity, and feed consumption.

Cattle

Seven Holstein bull calves, weighing between 150 and 200 lb., were shipped from Iowa and sold through a community sale to a dealer at the St. Joseph, Mo., stockyards. The animals exhibited symptoms of shipping fever, including elevation of temperature (more than 103 F.) (table 1), hacking cough, and nasal discharge.

A single intramuscular dose of 2 mg. per lb. of body weight of tetracycline resulted in a return to normal within 24 hours in three calves. Four required a second dose 24 hours after the first. (See table 1).

Five Hereford steers, weighing 600 lb., developed elevated temperatures, inappetence, nasal discharge, coughing, labored respiration, loss of weight, and scouring within 11 days following shipment from the stockyards. Administration of one intramuscular dose of tetracycline at 2 mg. per lb. resulted in normal temperatures and no scouring within 24 hours in four animals. The fifth had been affected

Research Division, American Cyanamid Company, Pearl River, N. Y.,* and South St. Joseph, Mo.**

†The trademark of American Cyanamid Company for the antibiotic, tetracycline, is polyotic.

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Fig. 1. Gaunt, depressed appearance observed frequently during late summer and fall typifies shipping fever in cattle.

TABLE 1. Temperature (Fahrenheit) Record of Calves with Shipping Fever, Treated with Tetracycline Intramuscular, 2 mg. per lb. Body Weight

Tag No.	Dates 5/8	5/9	5/10	5/11	5/12
48	102.8	103.2*	104.0*	103.0	102.0
56	0.4	1.4	4.0*	3.2*	3.0
51	2.2	1.8	3.2*	3.8*	2.4
55	1.8	2.4	2.4	3.8*	2.6
58	1.6	2.6	2.0	4.4*	2.2
49	0.6	1.0	4.6*	3.4*	2.6
53	2.2	1.6	1.0	4.0*	1.6

*Treated.

clinically for five days, and had not responded to previous administration of penicillin and sulfonamides.

Swine

In a herd of 140 grade Hampshire pigs, weighing 90 to 150 lb., elevated temperatures, inappetence, weight loss, labored, "thumpy" breathing, gastritis, and enteritis were noted approximately two weeks after date of shipment. Within that time, a total of 24 pigs died. Forty others sickened. Necropsy revealed pneumonia as the primary lesion. Affected animals were treated with penicillin and sulfonamides with little beneficial effect.

One week later, necropsy of three additional animals again revealed pneumonia. There was some evidence of eperythrozoonosis in two pigs, but no attempt was made to establish such a diagnosis by laboratory procedures. Bacteriological examination of the three pigs demonstrated *B. subtilis* in blood, and *Pasteurella multocida* in kidney, heart, lung, spleen, and liver.

Twenty-two obviously sick pigs that had received no previous treatment, or none within one week, were selected for treatment. A single dose of tetracycline at 2 mg. per lb. was administered intramuscularly to each animal, once daily for two treatments.

As shown in table 2, there was a significant drop in temperature in 16 of the 22 animals within the first 24 hours after initial treatment. Following treatment, 21 pigs showed definite improvement clinically, while one, 9842, died the fourth day. There was slight elevation of temperature (1° or more) in 15 of the 22 pigs on the 96-hour temperature check. However, this was within what could be considered the normal range, and, for the most part, was not reflected clinically. A few animals still exhibited slight dyspnea at this time. Uneventful recovery followed.

TABLE 2. Temperature Record of Swine with Shipping Fever, Treated with Tetracycline Intramuscular, 2 mg. per lb. Body Weight

Tag No.	Treated—Day First	Second	Observation 4th Day
9837	105.3	101.2	102.2
38	4.0	1.0	3.0
39	7.2	5.0	4.4
40	3.4	1.3	4.0
41	4.2	1.4	2.7
42	5.6	4.0	5.2 Died
43	5.6	4.0	5.3
44	4.0	3.0	4.0
45	5.4	3.0	3.3
46	3.4	1.3	1.2
47	6.6	4.0	2.0
48	3.0	4.0	2.0
49	6.2	2.2	4.0
50	4.2	1.8	1.2
51	4.4	3.0	2.4
52	4.2	2.4	2.2
53	4.4	2.2	2.2
54	5.0	4.0	4.0
55	4.0	1.4	2.4
56	4.0	2.3	3.3
57	5.0	3.0	4.4
58	4.0	3.0	5.4

Sheep

A band of approximately 1,500 sheep were shipped from western Texas to a commercial feed lot in Missouri. Within ten days, 75 had died of all causes, 42 within 48 hours immediately prior to treatment. Greatly elevated temperatures and enteritis were noted in addition to the usual respiratory symptoms. Necropsy revealed pneumonia.

Fig. 2. Hemorrhagic septicemia (shipping fever) is responsible for significant mortality among feed lot lambs.

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Fifteen severely affected sheep, including two in advanced stages of illness, received two intramuscular doses of tetracycline at 2 mg. per lb. at a 24-hour interval. On examination 16 hours after initial treatment, all those treated were markedly improved. In 24 hours, there was a significant reduction in temperature in all cases but one (table 3). Four sheep succumbed within five days. All had marked, persistent diarrhea. A total of 21 untreated sheep in the feed lot died while these test animals were under observation.

In all the cases reported above, there was no evidence of toxicity or local tissue reaction.

TABLE 3. Temperature Record of Sheep with Shipping Fever, Treated with Tetracycline Intramuscular, 2 mg. per lb. Body Weight

Tag No.	Treated—Day First	Second	Observation only—4th day	Results
1	104.5	103.4	99.0	Died
2	5.0	3.7	103.0	Rec.
3	6.0	2.8	3.8	Died
4	4.5	4.8	3.2	Rec.
5	3.4	2.5	2.0	Rec.
6	6.5	3.2	2.0	Rec.
7	3.5	2.4	2.2	Rec.
8	5.0	4.0	4.0	Rec.
9	6.0	5.4	5.2	Died
10	7.0	7.4	6.2	Died
11	4.0	3.0	2.4	Rec.
12	5.0	2.2	2.8	Rec.
13	3.5	3.4	2.0	Rec.
14	4.0	2.6	3.6	Rec.
15	4.0	3.0	2.0	Rec.

Comment

Results obtained indicate that tetracycline is effective in the treatment of shipping fever of cattle, pigs, and sheep. In all cases, animals had been subjected to the rigors of shipping, and all were maintained and treated under conditions found in the field.

Summary

Twelve cattle, 22 pigs, and 15 sheep with shipping fever were treated with tetracycline, administered intramuscularly in a single, daily dose of 2 mg. per lb. of body weight. Seven of the 12 cattle recovered following a single dose. Four additional cattle, 21 pigs, and 11 sheep responded to two doses, administered at a 24-hour interval.

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Mucosal Disease in Cattle

(*Continued from page 434*)

chickens. Chick embryo culture of the infective agent has been unsuccessful.

Conclusions

The condition described under the term mucosal disease is similar to malignant catarrhal fever, virus diarrhea, rhinotracheitis and rinderpest. Little is known of its etiology or means of transmission. Frequently it has been misdiagnosed as coccidiosis, avitaminosis, infectious keratitis, hemorrhagic septicemia, and rabies. Because of the increased incidence or recognition of mucosal disease as a distinct entity in cattle of the United States and the great similarity of symptoms and lesions with those of rinderpest, veterinarians are urged to be alert to the threat of a serious disease threat.

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SMALL ANIMAL PRACTICE

Desoxycorticosterone Acetate In The Treatment Of Uremia In Dogs

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UREMIA is a fatal syndrome of dogs observed most frequently between the ages of six and ten years. The onset of signs is commonly attributed to kidney failure resulting in a decreased renal clearance of nitrogenous waste products. This kidney failure can result from a serious, acute, systemic condition or might be a flareup of chronic nephritis. Although this condition receives its name from high levels of blood urea, urea at these levels is relatively nontoxic. The symptoms may result from retention of other associated compounds (possibly phenols) and from the accompanying severe acidosis.

Although uremia is not a specific disease as such, the classical case is quite characteristic. The condition is often intermittent, and episodes of uremia alternating with periods of relative normality are not uncommon. In many cases, the animal exhibits signs of chronic interstitial nephritis before and after the onset of uremia; this accounts for the variable picture presented by urinalysis. A common situation is that of a dog with a chronic kidney disease exposed to stress resulting in uremia. Common symptoms of this syndrome are anorexia, emaciation, vomition, and other gastrointestinal disturbances, conjunctival hyperemia, normal to subnormal temperature, fetid mouth odor with necrotic stomatitis and/or glossitis, and occasionally hypoplastic anemia[a]. These signs can be complicated by others associated with the underlying renal pathology. The laboratory findings are also variable and again depend on the associated kidney disease. However, the blood urea nitrogen (BUN) is almost always elevated and is sometimes as high as 500 mg. per 100 ml. of blood (normal 20-30 mg.%). Urinalysis reveals usually albuminuria with granular casts; and in many cases the urine specific gravity will be abnormally low. In other cases, in which oliguria is present, specific gravity will be high. There is often a leukocytosis, but the differential count varies considerably. Hemoconcentration is a relatively constant finding.

The case mortality rate of uremic patients is high. Renal and gastrointestinal lesions are consistently present at necropsy. The renal lesions are usually an acute or chronic interstitial nephritis; ulcerative or hemorrhagic gastritis and/or enteritis are found frequently.

Treatment is difficult and is based upon attempts to restore fluids and force the clearance of toxic materials. The prognosis should be guarded or unfavorable.

Large amounts of parenteral fluids are used in an attempt to restore a normal fluid balance. For this purpose, 5% dextrose in saline is recommended though some prefer 5% dextrose in distilled water[a]. Since high potassium

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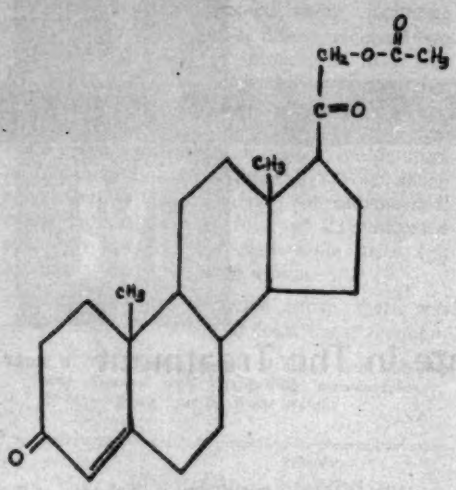

Desoxycorticosterone acetate (DCA)

blood levels probably contribute significantly to the high degree of mortality of uremic episodes,[9] sodium should be supplied to restore a normal blood potassium level. Since sodium chloride (NaCl) tends to aggravate acidosis, it probably would be better to use a mixture of 2 volumes of 0.9% NaCl and 1 volume of 1.3% $NaHCO_3$ (or 1/6 M sodium lactate) as the solute for the dextrose[9].

Parenteral feeding is often necessary because of the irritability of the gastric mucosa. Dextrose solutions not only supply energy but also have a protein sparing action. There is some therapeutic rationale in favor of using fructose rather than dextrose[4]. Fructose requires less endogenous energy to enter the metabolic scheme than glucose.

Because of the cardiac embarrassment due to high potassium levels, calcium gluconate might be included in the infusion fluid. Antibiotics have been used widely for treating this condition and they appear to be of value in some cases; this is particularly true when a leptospiral nephritis is present.

Desoxycorticosterone, one of the so-called mineralocorticoids secreted by the adrenal cortex, has long been known as a sodium-retaining agent[10]. Injection of this hormone also causes potassium diuresis and increases the glomerular filtration rate in the dog[6,9]. For these reasons, it was felt that DCA (desoxycorticosterone acetate) could be valuable as an adjunct in the treatment of uremia. This agent has been used in the small animal clinic for the past three years on many cases exhibiting symptoms of uremia. The following case reports will serve to illustrate results.

Case Reports

Case 1. Seven-year-old male Collie cross. *History and symptoms:* Frequent kidney disturbances during the past two to three years with flareups coming about six months apart. At these times the hindlegs became stiff; history of vomition. Temperature 102.8 F. *Diagnosis:* Chronic interstitial nephritis. *Treatment:* 5 mg. DCA and enema. *Laboratory findings:* On admission, BUN (blood urea nitrogen) of 275 mg.%. Three days later, the BUN was 37.2 mg.%. *Comment:* This is an example of a mild case of uremia responding to DCA alone. Despite the mildness of the case symptomatically, the BUN was surprisingly high.

Case 2. Six-year-old female Shepherd cross. *History and symptoms:* History of anorexia of two days duration, depressed, shaking, and trembling. Abdomen was tense and slight pain was elicited upon palpation. Very dehydrated, congested conjunctiva, temperature 100.5 F. Foul mouth odor, yellowish feces, slight bronchial rasp. *Diagnosis:* Acute nephritis with renal uremia. *Treatment:* 500 ml. 5% dextrose in saline (unless otherwise specified all fluids were given subcutaneously) daily for six days, then alternate days for two more treatments; 2.5 mg. DCA intramuscularly (I.M.) on alternate days for three treatments; 300,000 units procaine penicillin and 0.5 gm. dihydrostreptomycin on alternate days for three treatments.

Laboratory findings: On admission, BUN of 260 mg.%, WBC of 20,500 RBC of 6,790,000; urinalysis revealed positive albumin, a few granular casts, and many leukocytes. One week later, BUN of 80 mg.%, urinalysis revealed a trace of albumin and a few leukocytes. *Comment:* This animal improved considerably after the initial treatment, and the appetite had increased by the third day. This is a typical example of a rather severe case of uremia in which DCA proved to be a helpful adjunct to the routine treatment.

Case 3. Four-year-old male Shepherd cross. *History and symptoms:* History of anorexia of ten days duration. Very depressed, congested conjunctiva. Temperature 100.5 F., no history of vomiting. *Diagnosis:* Acute nephritis with renal uremia. *Treatment:* 500 ml. of 5% dextrose in saline daily for five days, 2.5 mg. DCA I.M. on alternate days for three treatments, 2 ml. of metrazol on the day of admis-

sion, 600,000 units of procaine penicillin on alternate days for three treatments. *Laboratory findings:* On admission, BUN of 240 mg.%, WBC of 20,600, segmented neutrophils 87%, band neutrophils 5%, lymphocytes 7%, and monocytes 1%, RBC of 10,430,000, urinalysis revealed two plus albumin, and numerous granular casts. Six days later the BUN was 40 mg.%. *Comment:* Another example of a severe case of uremia; this patient was admitted in a semi-comatose state. The case was readmitted a month and a half later with encephalitic symptoms and no evidence of uremia (BUN of 28 mg.%). The owner requested euthanasia and necropsy revealed a mild interstitial nephritis and a chronic catarrhal enteritis. It is difficult to evalute the role of DCA in the progress of this case. It is, of course, possible that the drug precipitated the encephalitis, the etiological agent of which might have been present, but dormant, originally.

Case 4. Seven-year-old female Setter. *History and symptoms:* History of anorexia of three weeks duration. Dog shivered and the hind legs appeared to be getting weaker. Feces frothy and yellow. Free blood on the thermometer. Temperature 100.2 F. *Diagnosis:* Chronic interstitial nephritis. *Treatment:* 500 ml. of 5% dextrose in saline daily for the first two days and then every third day for three additional treatments, 2.5 mg. DCA I.M. on alternate days for five treatments, 300,000 units of procaine penicillin on alternate days for three treatments. Treated for a mild case of otitis media before discharge. *Laboratory findings:* On admission, BUN of 93 mg.% and a WBC of 14,650. Six days later the BUN was 20 mg.%. *Comment:* Despite the history of three weeks anorexia, this was a relatively mild case of uremia and responded well to the treatment.

Case 5. Nine-year-old male Cocker Spaniel. *History and symptoms:* History of rear leg trouble, not paralyzed but reluctant to use leg. Anorexia and vomiting. Temperature 100.8 F. *Diagnosis:* Chronic nephritis with renal uremia. *Treatment:* Multivitamin injection on day of admission, 500 ml. of 5% dextrose in saline for four days. Kept in the hospital for six more days, then discharged. *Laboratory findings:* On admission the BUN was 330 mg.%, WBC 13,250, 86% segmented neutrophils, 8% band neutrophils, 6% lymphocytes, and 5% monocytes, hemoglobin 14.5 gm./100 ml. Three days later the BUN was 103 mg.% and two days after this 46 mg.%. *Comment:* This is another example of a rather severe attack of uremia. We were able to keep this dog in the hospital for a relatively long period after treatment was discontinued.

Case 6. Eight-year-old female Miniature Schnauzer. *History and symptoms:* Came in with a history of anorexia, vomition, and bloody feces. Vomitus was tinged with blood. The mucous membranes were icteric. There was no abdominal tenderness. *Diagnosis:* Chronic nephritis with renal uremia. *Treatment:* On admission, given 2 ml. of a parenteral coagulant, 250 ml. of Ringer's solution daily for two days, 5 mg. DCA daily for two days, 300,000 units procaine penicillin daily for four days. *Laboratory findings:* On admission, BUN of 160 mg.%, WBC 12,500, 82% segmented neutrophils, 3% band neutrophils, 13% lymphocytes, 1% monocytes, and 1% eosinophils, RBC of 8,640,000. Four days later the BUN was 44 mg.%. *Comment:* Symptomatically this dog appeared to be a rather serious case of uremia. However, the response to treatment was good and the laboratory findings indicated a milder case than we had thought. Probably this represents a case which was noticed early and presented for treatment before it had progressed to an advanced stage.

Case 7. Ten-year-old female Australian Shepherd. *History and symptoms:* History of anorexia and vomiting of four days duration. Obese, icteric, with abdominal tenderness. There was evidence of diarrhea and urinary dribbling. *Diagnosis:* Acute nephritis with renal uremia. *Treatment:* Given 5 mg. DCA and 500 ml. of 5% dextrose in saline and 600,000 units procaine penicillin on day of admission. This treatment was repeated the next day. The animal died during the night. The owner did not permit necropsy. *Laboratory findings:* On admission, BUN of 400 mg.%, WBC of 23,700. *Comment:* This represents a typical case presented late in the course of the disease. This case emphasizes the fact that DCA is not specific but is merely an adjunct to other treatment.

Case 8. Six-year-old male Cocker Spaniel. *History and symptoms:* Anorexia of three days duration, no vomition, tucked up abdomen, stilted gait, emaciated, and depressed. *Diagnosis:* Acute nephritis with renal uremia. *Treatment:* In shock on arrival and died soon after arrival. *Laboratory findings:* On admission BUN of 164 mg.%, WBC of 18,800 with 82% segmented neutrophils, 7% band neutrophils, 7% lymphocytes, and 4% monocytes. Necropsy revealed a severe chronic interstitial

TABLE 1. Blood Urea Nitrogen (BUN) Levels Before and After Treatment with Desoxycorticosterone

Case No.	Pretreatment	Post-treatment	Days post-treatment
1	275 mg.%	37 mg.%	3
2	260 mg.%	80 mg.%	7
3	240 mg.%	40 mg.%	6
4	93 mg.%	20 mg.%	6
5	330 mg.%	103 mg.%	3
		46 mg.%	5
6	160 mg.%	44 mg.%	4

nephritis, acute ulcerative stomatitis, acute hemorrhagic gastritis, and acute catarrhal enteritis. *Comment:* This case emphasizes the fact that the BUN level is not always in direct proportion to the seriousness of the attack.

Case 9. Eight-year-old male Cocker Spaniel. *History and symptoms:* Came in with a history of anorexia of three days duration. No vomition. Bloody mucous was noted on thermometer and the temperature was 101 F. Dog was emaciated. *Diagnosis:* Chronic interstitial nephritis. *Treatment:* 250 ml. of 5% dextrose in saline daily for five days, 300,000 units of procaine penicillin daily for five days. 0.5 gm. dihydrostreptomycin daily for four days, gastric sedation daily for four days. The animal did not respond to treatment and died on the fourth day. *Laboratory findings:* On admission, BUN of 112 mg.%, WBC of 13,000, 61% segmented neutrophils, 7% band neutrophils, 20% lymphocytes, 5% monocytes, and 7% eosinophils; urine was three plus positive for albumin but otherwise normal. Three days after admission the BUN was 151 mg.%. Necropsy revealed chronic interstitial nephritis and catarrhal gastroenteritis. *Comment:* This was selected as a relatively typical case of uremia not treated with DCA. Many uremia cases have a much higher BUN than this one and many have a history of vomition. Despite vigorous treatment with fluids and antibiotics the dog became worse and was comatose after three days treatment.

Discussion

From our clinical experience it would appear that desoxycorticosterone acetate is a useful drug in the treatment of uremia. It must be pointed out that it can not be relied upon as a single treatment except in selected mild cases. Certainly fluids and supportive treatment always are indicated. Many cases of uremia will not respond to treatment of any kind. In practically all our cases which have been treated with DCA, and in which more than one BUN was determined, the blood urea nitrogen level decreased markedly after treatment (see table 1).

In general, when treating uremia, if the patient can be sustained beyond the critical period when toxic products are retained, recovery can be expected. One of the earliest treatments of uremia was the induction of diarrhea and, at one time, intestinal dialysis was established as a relatively successful treatment in man[9]. Desoxycorticosterone, in combination with fluids, is a helpful treatment because it: (1) Increases sodium retention and thus fluid retention,[10] (2) increases potassium excretion[8] thus aiding in the clearance of a notably toxic product, and (3) increases glomerular filtration thus aiding in the reduction of the azotemia.

It is of interest to compare the symptoms of uremia in the dog with those of chronic adrenal insufficiency in man (Addison's disease). Addison[3] originally described the symptoms of chronic adrenal insufficiency as "anemia, general languor and debility, remarkable feebleness of the heart's action, irritability of the stomach and a peculiar change in the colour of the skin." Thorn[11] states that adrenal insuf-

TABLE 2. Comparison of Renal Uremia with Chronic Adrenal Cortical Insufficiency

	Adrenal insufficiency Man	Renal uremia Dog
Occurrence	late middle age	late middle age
Weakness and fatigibility	consistently	consistently
Weight loss	consistently	consistently
Increasing pigmentation	usually	no
Anorexia	usually	usually
Vomition	commonly	commonly
Abdominal pain	sometimes	sometimes
Constipation or diarrhea	sometimes	consistently one or other
Neurological symptoms	sometimes	sometimes
Attacks following stress	yes	yes
Necrotic stomatitis	not reported	commonly
Hypotension	commmonly	probably
Anemia	sometimes	commonly
Lymphocytosis	commonly	no
Leukocytosis	commonly	commonly
Increased BUN	usually	consistently
Hemoconcentration	usually	usually
Increased blood K	usually	no report
Urine albumin	negative	usually positive
Urine casts	negative	sometimes positive
Urine specific gravity	low	if no oliguria, low
Eosinophilia	commonly	not reported

ficiency should be considered whenever; (1) there is unexplained weight loss and asthenia, (2) there are unexplained gastrointestinal symptoms. Table 2 compares these two diseases as to symptoms and laboratory findings. In view of this similarity, four possibilities present themselves: (1) Many cases of uremia may be caused by a primary adrenal cortical insufficiency; (2) the toxic products retained in uremia may inhibit markedly the function of the adrenal cortex; (3) the adrenal cortex might be exhausted from the long chronic illness which is often associated with uremia. In this case, a sudden severe stress would precipitate an attack of adrenal cortical insufficiency. Clinical findings suggest that undue exposure to stress often results in an uremic attack. This would be a form of the exhaustion stage of Selye's General Adaptation Syndrome[8]; (4) the similarity between the two conditions could possibly be coincidental.

Exhaustion or temporary inhibition of the adrenal cortex are the more likely possibilities since many dogs will survive an attack of uremia and live for many years without further supplementation. In cases which lapse immediately into signs of uremia following withdrawal of the treatment and exposure to mild stress, adrenal cortical destruction should be considered. Even if the two diseases are not directly related, desoxycorticosterone is probably a good treatment for the reasons previously mentioned.

Adrenal cortical insufficiency in the dog has been reported by Hadlow[3] in a review of three cases. Clinically, his animals exhibited anorexia, vomition, weight loss, hemoconcentration, and an elevated BUN. It is quite possible that these cases would be diagnosed and treated as renal uremia when they were in reality, adrenal cortical insufficiency. It would be interesting to apply the eosinophil screening test as suggested by Martin[7] to cases of uremia. Even if it is not feasible to apply the entire procedure in some cases, a total eosinophil count would render valuable information. A high eosinophil count in a stressed, nonparasitized animal would indicate hypofunction of the adrenal cortex. Unfortunately, accurate total eosinophil counts were not made in this series of cases.

Summary

This report is not intended as experimental evidence indicating that renal uremia is caused by adrenal insufficiency. This matter would have to be explored with careful exhaustive laboratory analyses. We feel that the evidence presented here indicates this as a strong possibility. Our work with DCA indicates that, regardless of the etiology, this agent is useful in the treatment of renal uremia in the dog.

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A total of 14 cases of laboratory-proved cases of rabies in dogs are reported from two counties in Southeastern Michigan during April and May.

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Veterinary Epidemiologist Dr. Paul Arnstein, New York Department of Health, reports that six cases of psittacosis were confirmed by compliment-fixation tests as a result of a limited survey. Contact with psittacine birds (parakeets) is responsible for majority of isolated cases of psittacosis in man.

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Negri bodies were demonstrated in a bat caught in Montana. The Rocky Mountain Laboratory in Hamilton reports that this is the second proved case of rabies in bats in that state.

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Vaccination of any animal for any infectious disease is a calculated risk.

Listeriosis in Chinchillas: A Case Report

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Madison, Wisconsin

Between January 14 and 20, 1955 four dead chinchillas were received at the Wisconsin Animal Disease Diagnostic Laboratory. The owner had a cavy of 57.

In three years of raising chinchillas, no major disease problems had occurred until this present outbreak. The animals were housed in a basement. There had been no recent changes in hay or pellets. Sanitation was described as good. By the time these dead chinchillas were received, a total of 14 had died.

There was no difference in age susceptibility. No listeriosis had been diagnosed previously on this farm, to the veterinarian's knowledge. The owner also raised cattle in addition to his chinchillas. A total of 35 chinchillas died over a period of three months before this endemic was brought under control.

Symptoms

Deaths were sudden, occurring from a few hours to two days. In addition, inappetence and listlessness were described.

Autopsy Findings

The attending veterinarian reported septicemic lesions in three chinchillas necropsied. Those received for study were not ideal as necropsy material, but the following postmortem lesions were noted in one or more of them: Pulmonary edema, enlarged kidneys, enlarged liver studded with small grey-white foci, stomachs full of feed, intestines distended with gas and ascites. All chinchillas examined revealed evidence of postmortem change. The lesion observed most frequently was an enlarged, discolored liver, studded with grey-white, or yellowish-white foci about one to two mm. in diameter.

Bacteriological

An organism having the morphological and biochemical properties of *Listeria monocytogenes* was recovered from the spleens, kidneys, livers, and lungs of four chinchillas examined. The isolate, a small Gram-positive bacillus, was slightly motile at 25 C. and non-motile at 37 C. The organism was catalase positive, hydrogen sulfide and indol negative, and produced acid from glucose, lactose, salicin, and rhamnose.

The organism was pathogenic for white mice and guinea pigs. Intraperitoneal injection of 0.1 ml. of a 24-hour broth culture proved fatal within 48 hours. On autopsy, lesions similar to those observed in the chinchilla presented were observed in the livers. The organism was reisolated from the injected laboratory animals. On the basis of these findings this organism was considered to be *Listeria monocytogenes*.

The Listeria isolated was tested for antibiotic sensitivity, and found to be resistant to penicillin and sensitive to terramycin®[1].

Treatment

Preliminary treatment was of little value before an etiological diagnosis was made. Penicillin and streptomycin injections did not consistently alter the course in those noticed sick. This treatment saved two chinchillas, but others receiving the same treatment died. An attempt to increase resistance in those that appeared to be clinically well, by injections of bovine Pasteurella-Corynebacterium bacterin caused a severe reaction in the first four injected. This procedure was stopped immediately.

After a diagnosis of listeriosis was made by this laboratory, a new regimen of treatment was started. Tetracyline hydrochloride (polyotic)®[2] was added in the drinking water and those animals exhibiting signs of illness were injected with the recommended dose of terramycin.

In addition to the treatment described above, certain management changes were recommended. Those chinchillas that the owner thought were "not right" were segregated and kept in a little warmer room. This treatment and change in management appeared to influence the outbreak favorably.

The character of the disease in this instance was much like that described in rabbits by Murray *et al.* (1926) who first reported on listeriosis.

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®[1]Chas. Pfizer & Co., Brooklyn, N. Y.
®[2]Lederle Laboratories Division, Pearl River, N. Y.

Psychology Affecting Doctor-Client Relationships†

KENNETH B. HAAS, SR. Ed. D., Chicago, Illinois

SOME practitioners believe that I have some kind of secret formula for making clients like you, believe in you, and come to you.

The truth is, I have just as many human relations problems as you, but fortunately I have had the time and the inclination and energy to find answers to a great many of the problems that have bothered veterinarians throughout the history of the profession, and in all countries. Right now I would like to tell you about some basic truths that will help you to have more pleasant client relations and a more profitable practice.

Be at Ease

It is my feeling that an easy mind is the first item of personal depth in respect to your client relations. You should be a comfortable person, first of all, *i.e.*, one with whom others feel at ease. You can not work and worry, so why worry?

Sooner or later, a man, if he is wise, discovers that life is a mixture of good days and bad, victory and defeat, give and take. He learns that it does not pay to be a sensitive soul; that he should let some things pass. He learns that he who loses his temper usually loses out. He learns that all men have burnt toast for breakfast now and then, and that he should not take the other fellow's grouch too seriously. He learns that carrying a chip on his shoulder is the easiest way to get into a fight, and the quickest way to become unpopular is to carry tales and gossip about others. He learns that buck-passing always turns out to be a boomerang, and that it never pays. He comes to realize that the business could run along fairly well without him. He learns that it does not matter too much who gets the credit so long as the job is done.

He learns that all people are human and respond to a smile and a hearty "good morning". He learns that most of the other fellows are as ambitious as he is, that they have brains as good or better, and that hard work, and not cleverness, is the secret of success. He learns to sympathize with the youngster coming into the profession because he remembers how bewildered he was when he first started. He learns not to worry when he makes a blunder because experience has shown him that if he always gives his best, his average will break pretty well. He learns that no man ever got to first base alone, and that it is only through cooperative effort that he can move on to better things. He learns that bosses are not slave drivers, trying to get the last ounce of work out of him for the least amount of pay, but that they are usually fine men who have succeeded through hard work.

Value of Praise

The ability to "build people up" is the second item of depth. You already know that people are not more difficult to get along with in one place than another and that getting along depends upon your own behavior toward others. It is human nature for others to act as you do. Reciprocal action starts with liking people yourself. Getting people to like you, trust you, and be friendly with you will be in proportion to your attitude toward them. When you like people they will like you. If you elevate their feeling of self importance and embrace their feeling of self-respect you show high esteem for them — and they will reciprocate that feeling.

Master salespeople tell us that there is a great sales advantage in making people feel important. It helps in winning people to our way of thinking. Psychologists have proved that this feeling of importance is the thing closest to everyone's heart. This is a fact, and you should use it to make your selling easier and more productive. You must always guard against tearing down a person's good opinion of himself. Talk in terms of his wants, needs, desires. Tell him how he will benefit from your products and services and

†Presented at the 22nd annual meeting of the American Animal Hospital Association, Detroit, Mich., May 4-7, 1955.

how they will help him. Most clients like to consider that they are very busy, whether they are or are not. Also they like to have you think of their convenience and make a point of saving their time.

Offer the client assurances. People like assurances. In this manner you show clients how you understand and sympathize with them. You make clients think that they are perfectly normal people to feel as they do — at the moment. Example: "I can understand your feelings. Successful husbandrymen felt exactly as you do until they had an opportunity to see how this treatment speeds growth and reduces costs."

Explain — don't argue. By not arguing, you show that the client has a right to his opinion; that is important. Clients hesitate to argue with facts but they will fight hard to support their own opinions. Yes, and get angry. Few clients will criticize themselves no matter how wrong they are. Arguing puts them on the defensive and arouses resentment. No one ever won an argument.

Pronounce names correctly. Clients like to have their names pronounced correctly. The one thing that a man really owns is his name. Get it right, pronounce it correctly, and remember to use it. It is a distinct compliment to a person when you do.

Use a business-like approach. You build up your client's pride and importance by your business-like approach when you get down to business quickly and give him the feeling that you and he are to consider and make an important decision. When you have an indifferent manner, it deflates the prospect's pride and makes him feel unimportant.

Ask questions and listen. Ask questions for his opinions, then listen, you thus show respect for the other fellow's knowledge. For example: "It will be immediately apparent to you, Mr. Brown, how much you can save from this treatment. You know better than I . . . "

In this way, you can, by not showing off your own importance, and by giving the other fellow a greater sense of importance, get him to like you, listen to you, and respect you.

Build people up through recognition and praise. Recognition and praise may be silent or spoken. For example, a friendly smile that says, "I'm happy to see you" is silent praise. Other forms of silent praise may be expressed by gallantry, appreciation, courtesy, kindness, thoughtfulness, and consideration for others.

Silent praise may also be offered when you send a birthday, anniversary or holiday card; when you send a clipping or newspaper item about something they have said or done. A gift or attention of any kind is silent praise and recognition of the feelings of others.

Spoken praise, or recognition, is the kind you may want to use most often. To start, you should know the basic ways to offer it. There are five chief ways to offer spoken praise:

1. Ask for information, advice, direction and/or expression of opinion.

2. Let your client know you admire his knowledge, experience, strength, and maturity.

3. Suggest personal physical abilities, assets, or charm.

4. Praise the possessions, products, or children of others.

5. Use direct personal compliments.

When you look for the good in others and tell them about it, you make people look for the good in you. Try to praise people, compliment people, commend people, recognize and build their feeling of self-importance and they will trust you, like you, cling to you, and do business with you.

Be a Good Listener

The third item of professional depth is to be a good listener. You praise and recognize a person when you listen carefully. Listening has a double purpose. You compliment and draw out the information you require to present your proposition in the most favorable light. Many veterinarians emphasize talking, yet many times it is more important to be a good listener than to be a good talker. Often you can listen your way to a sale when you can't talk your way to one.

Listen to inflate your prospect's pride.

Listen to learn your prospect's needs.

Listen and learn what to say to sell.

Listen to make him like you.

We have two ears and one mouth because nature intended for us to listen twice as much as we talk. One of the greatest compliments you can pay a client, is to listen. When you listen to a person you are saying, in a sense, "The most worthwhile way I can spend my time right now is to learn more about your experiences and opinions".

It is not a matter of making clients happy by never talking; that's certainly wrong. Rather, it is knowing when to talk and knowing what to say by listening. Listen to get acquainted

with the client's opinions, whether outspoken or just "hinted." Get his ideas on your competitors and their ways of handling a practice, then you can copy the good and shun the bad.

Listen to the client to determine his moods. The veterinarian who listens for the client's moods, tunes in on the client's wave length, calculates his next move by listening and "taking the client's pulse", can put punch in his advice, presentation of demonstration. Go along with the client's impulses. Get "hepped" on what he's "hepped" on and, in addition, develop a sense of proper timing. It's not so hard to do.

Remember that fees come from a client's head, so find out what is going on there. Listen for objections, alibis, excuses and complaints you can catch and use. Objections to fees probably rank first in your dealings.

Fees for Services

Many veterinarians have an emotional block when the topic of selling their services is mentioned. Too many think that they should not be merchandisers, salesmen, or businessmen. They feel in a vague way that professional service and money can not wed. They forget that ancient Roman adage *"Pecunia non olet"*. Moreover the proper assessment of fees is one of the most important factors in the conduct of a successful practice.

All merchandisers, of all products, meet mental and emotional resistance when a product or service is being bought and sold. Psychologically, objections, excuses, alibis and complaints are merely the client's ways of obtaining further information or of reassuring himself about the quality, quantity or price of the professional service or product. He wonders if the treatment will meet his expectations, so he says, "I believe this treatment costs too much." He actually wants the veterinarian to show him, to reassure him, that the treatment is worth the fee and will be permanent.

Listen to the complaint; drag it out into the open. Show by your attitude that you respect the stand your dissatisfied client has taken.

Relax physically, but not mentally. Do not fear complaints, reluctance, and resistance about an established fee. Simply recognize that they are signals on the part of the client that he has certain fears and expects and wants you to help him feel that they are groundless.

The third thing to do is use assurance phrases. For example, "Mr. Jones, I can understand why you feel the way you do. In fact, several of my most satisfied clients once felt exactly as you do. But now that they see the extra profits they have gained from this treatment and are asking for it." There are many others.

When you use assurance phrases with your explanation you show that you understand and respect the client's viewpoint. You show that you sympathize with him. But now show that you do not necessarily agree with him. Furthermore, this method helps to avoid arguments.

Nothing in your profession can take the place of human relation factors. Talent will not; for nothing is more common than unsuccessful men with talent. Genius will not. Unrewarded genius is almost a proverb. Education will not. The world is replete with educated derelicts.

Good human relations and their persistent uses are almost omnipotent, for they have solved, and always will solve, the most pressing problems, of the veterinarian.

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Odyssey for International Dog Judges

Capt. Will Judy, editor of Dog World, with Mrs. Judy left Chicago on September 16 for a trip to Australia and New Zealand to judge at three major dog shows scheduled for late September and October at Melbourne and Perth, Australia, Launceston, on the Island of Tasmania, and at Hamilton, New Zealand.

The Judys hold distinction as the world's most traveled dog judges, having served in the capacity in several countries of Europe, Asia, Africa, South America, Mexico, Alaska, and Canada.

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Spckesman for the Dog Food Division of the American Feed Manufacturers Association states that the dog food industry is approximately equal to that of the breakfast cereal industry in gross sales.

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A new virus laboratory has been equipped at the Texas A. & M. College for the study of ornithosis in turkeys. Dr. John P. Delaplane, Department of Bacteriology, School of Veterinary Medicine, will be in charge of the study project.

Use of Neomycin and Erythromycin In Veterinary Practice†

KENNETH B. HAAS,* D.V.M., Kalamazoo, Michigan

NEOMYCIN and erythromycin are two of the newer antibiotics. Both have unique therapeutic potential in veterinary practice. It is the purpose of this paper to discuss briefly these antibiotics, describe them and their actions, present indications for their use, and recommend dosages.

Neomycin

Source — *Streptomyces fradiae.*

Spectrum — Gram-positives, Gram-negatives, acid-fast microorganisms.

Action — Bactericidal.

Stability — Thermostable, microorganism stable, powder indefinitely stable.

Solubility — Water soluble, insoluble in organic solvents.

Resistance — Clinically unrecognized.

Toxicity — None orally, topically.

Neomycin is a broad-spectrum antibiotic derived from the soil isolate *Streptomyces fradiae.* It has action against both Gram-positive and Gram-negative groups of microorganisms. It has no antiviral, antiprotozoal, or antifungal properties. Its action is primarily bactericidal in nature, as opposed to bacteriostatic. It is stable under conditions of wide fluctuation in temperature, and is not inactivated by bacteria, or products of bacterial growth. Thus, it is fully active in presence of pus and pus-forming organisms. The sulfate powder is indefinitely stable, the drop and ointment forms stable over long periods. The powder may be easily dissolved in water and infused into the bovine udder or body cavities. Clinical resistance has not been described. Building *in vitro* resistance can be accomplished only by methods difficult to simulate in the living animal. The antibiotic is not toxic when administered orally or applied topically[1].

The antibacterial spectrum of neomycin demonstrates that several organisms commonly incriminated in bovine mastitis are readily susceptible to neomycin; that both Gram-positive and Gram-negative forms are included, and that both Pseudomonas and Proteus are inhibited. Currently neomycin is the only antibiotic highly active against both Pseudomonas and Proteus.

Antibacterial Spectrum of Neomycin
(Expressed in micrograms per ml. required to inhibit test organisms)

Strep. agalactiae (15)	.17	*Ps. aeruginosa*	.33
Strep. dysgalactiae (22)	.17	*Br. abortus*	.05
Strep. uberis (29)	.17	*K. pneumoniae*	.10
Staph. albus	.01	*Proteus vulgaris*	.13
Staph. aureus	.01	*Sal. schott.*	.11
Strep. fecalis	.11	*M. tuberculosis* (607)	.29
B. anthracis	.02	*D. pneumoniae*	10.00
A. aerogenes	.14	*Strep. viridans*	33.00
E. typhosa	.03	*Strep. hemolyticus*	10.00
		E. coli	.11

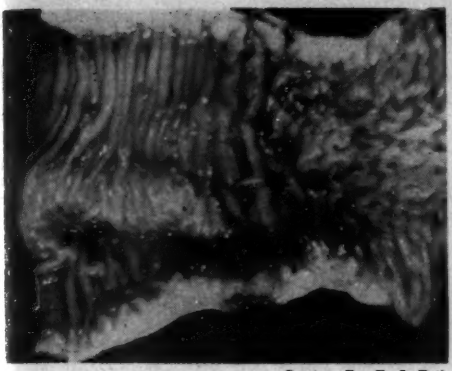
Indications

Current indications for neomycin therapy in veterinary practice are: (1) Bovine mastitis, (2) infectious dysentery in large and small animals, (3) otitis externa in dogs and cats, (4) eczematous dermatitis, (5) infected wounds, (6) keratoconjunctivitis, (7) corneal ulcers, and (8) blepharitis. Briefly, then, indications comprise bovine mastitis, enteric infections, and certain topical infections of eyes, ears, and skin.

Bovine Mastitis. Extensive clinical trials[2] have demonstrated neomycin sulfate to be strikingly effective in treating bovine mastitis caused by streptococci, staphylococci, coliforms, and Pseudomonas organisms. These also proved neomycin solutions to be nonirritating to mammary tissue. These data are especially significant in that Pseudomonas-caused mastitis responded to this new therapy, which in the past was more or less refractory to antibiotic treatment.

†Presented at te 26th general meeting of the College of Veterinary Surgeons of the Province of Quebec, Montreal, Quebec, Canada, Aug. 13-14, 1954.

*Department of Veterinary Medicine, The Upjohn Company.



Courtesy Dr. E. J. Poth

Fig. 1. Anastomotic site from dog preoperatively prepared with neomycin. Note absence of edema and inflammation.

Three forms of neomycin sulfate are available for treatment of mastitis: Sterile powder, collapsible teat-tubes, and disposable plastic syringes. The sterile solution of neomycin sulfate is made by aseptically introducing 10 to 20 cc. of sterile physiologic saline or water for injection into the 0.5 gm. vial of sterile neomycin powder. The resulting solution then is infused into the infected quarter. Treatment may be repeated at 12 to 24 hour intervals, if necessary. In clinical use, however, usually only one infusion is necessary.

The single-dose collapsible tube, or the disposable plastic syringe, with a special applicator tip, may be used to inject 500 mg. of neomycin into an infected quarter. This is done aseptically, after milking out all four quarters. These should not be stripped for at least six hours after instillation, and milk from treated segments should be discarded, or used for purposes other than human consumption for at least 72 hours.

Enteric Infections. Neomycin is absorbed only minutely from the gastrointestinal tract and therefore may be used effectively to eliminate pathogenic intestinal flora. It has a broad spectrum activity in the intestines and is bactericidal against some of the penicillin and streptomycin-resistant organisms. Neomycin sulfate has been found useful as an intestinal antiseptic in dogs,[3,4] in treating infectious hemorrhagic enteritis in pigs, and to relieve symptoms of infectious diarrhea in cats, puppies, and dogs.

Neomycin sulfate fulfills all the requirements for the "ideal intestinal antiseptic":[5] (1) Broad antibacterial spectrum, (2) low toxicity, (3) stability in presence of digestive ferments, (4) prevention of development or overgrowth of resistant bacterial variants, (5) rapidity of action, (6) limited absorption from gastrointestinal tract, (7) action in presence of foods or other foreign substances, allowing intake of foods and fluids, (8) value in mechanical cleansing of the bowel without causing dehydration, (9) non-interference with tissue growth and repair, (11) low dosage requirement, (12) solubility in water, (13) palatability, and (14) use limited to intestinal antisepsis.

Neomycin sterile powder may be put into solution and administered by intubation, or by gelatin capsules for oral use. The 0.5 gm. tablet is usually preferred, however.

In calf scours[6,7,8] and foal enteritis, complete control has followed an initial dose of 1 gm., followed by two 0.5 gm. doses on the same day. Two grams, in divided doses, have been given on each subsequent day, and repeated daily if necessary. These are minimal doses.

In dogs and cats, 0.5 gm. tablets two or three times daily have been effective in severe bacterial diarrhea.

For administration to feedlot pigs, the powder may be mixed with milk or concentrate for self-medication. It may be administered for seven or eight days consecutively, if necessary, the course repeated after a lapse of four days.

A neomycin-kaolin-pectin combination in fluid form has been particularly useful as an antidiarrheal medicant in large and small[4] animals. Dose recommended is 2 oz. two or three times daily to calves or foals, ¼ to ½ oz. two or three times daily for dogs and cats.

Satisfactory intestinal antisepsis with sulfonamides may take as long as 15 days, whereas neomycin antisepsis may result in as short a period as four hours. Numbers of Gram-positive, Gram-negative, and coliform organisms are negligible after treatment. This renders the antibiotic useful not only as an antidiarrheal agent, but as a preoperative preparant. In addition, neomycin preoperative preparation enhances intestinal healing, as demonstrated by basic canine studies. (See fig. 1).

A number of dogs were divided into two groups, one served as a control, the other as a test group. The latter group was prepared with neomycin, the control group received no treatment. After three days, all animals were anesthetized and intestinal resections and anastomoses performed. Three days postsurgically, all animals were sacrificed and the anastomotic sites examined grossly and microscopically.

The control group demonstrated extensive

edema at the surgical site, with necrosis of the anastomotic ends. Histologically, there was little capillary ingrowth or fibroblastic invasion. The neomycin-prepared group demonstrated 60 to 80% reduction in edema at the anastomotic site, no evidence of necrosis, and evidence of healing by first intention.

Topical Use. Ointment, powder, and drop forms of neomycin are available for topical use. Of increasing popularity in veterinary practice is a neomycin-hydrocortisone combination. This possesses the broad spectrum antibacterial action of neomycin, plus the topical anti-inflammatory effects of hydrocortisone.

Ocular conditions such as keratitis, conjunctivitis, infectious keratoconjunctivitis (pink-eye), corneal ulcers, and corneal wounds are indications for neomycin therapy[8,9,10,11]. Neomycin powder, insufflated into eyes of cattle with pink-eye, has proved a near-specific[9]. The neomycin-hydrocortisone ophthalmic ointment or drop preparation is indicated in many ocular conditions[11]. Advantages of such antibacterial—anti-inflammatory therapy are: (1) Prompt response to treatment, (2) short course of disease, (3) more economical, as compared to systemic steroid therapy for the same conditions, and (4) less corneal vascularization and scarring.

Antibacterial Spectrum of Erythromycin

(Micrograms per milliliter required to inhibit a number of strains of test organisms)

Staph. albus	0.06	*Cl. tetani*	0.3
Staph. aureus	0.13	*E. coli*	37.5
Stap. aureus (hemolytic)	.01	*Shig. flexner*	6.0
		Sal. paratyphi	25.0
Strep. hemolyticus	0.8	*Sal. typhosa*	50.0
Strep. faecalis	.06	*Br. abortus*	10.0
K. pneumoniae	100.0	*Br. suis*	0.4
Cl. perfringens	3.0	*Br. melitensis*	.03
Cl. septicum	.02		

Canine and feline otitis externa also is affected beneficially by combination therapy. Infammation may play a greater role than actual infection, and responds readily to anti-inflammatory treatment. Also, ear contaminants may be diverse organisms. Gram-positive and Gram-negative organisms are susceptible to neomycin. Pseudomonas, often cultured from cases of otitis externa, is also susceptible. Neomycin is not inactivated by purulent discharges.

Skin conditions such as suppurative dermatitis and eczema are amenable to this therapy. Foot-rot in cattle and sheep (*Spherophorus necrophorus* infections) is benefited by application of neomycin lotion or powder. Routine sanitary, hygenic, and surgical procedures must compliment antibiotic treatment for best results.

Following dehorning, docking, or castrating, neomycin may be applied as an antibiotic dusting powder[8]. It also has promise of usefulness in uterine and vaginal infections of cattle and swine[8,9]. The powder may be placed in gelatin capsules and inserted into the uterus or it may be infused as a solution.

Erythromycin

Source — *Streptomyces erythreus.*

Spectrum — Gram-positives, few Gram-negatives, large viruses.

Action — Bactericidal.

Stability — Heat and pH labile, dry form stable.

Solubility — Water soluble.

Resistance — Develops slowly.

Toxicity — None.

When administered orally to dogs, erthromycin is absorbed and effects peak blood serum levels in three to five hours[12]. It diffuses through the placenta, and into pleural and dropsical fluids. In presence of normal liver function, it is concentrated in the liver. Excretion is by way of the kidneys, and large amounts are found in the feces.

Indications

Indications for erythromycin in small animal practice are: (1) Respiratory infections (primary pneumonia, secondary pneumonia) concurrent with or subsequent to canine distemper infection, bronchitis, and tracheitis, (2) infections of associated respiratory structures (laryngitis, pharyngitis, and tonsillitis), (3) urinary tract infections, and (4) early encephalitis syndromes.

Erythromycin has a penicillin-like spectrum and penicillin-like indications. It is active primarily against Gram-positive organisms, and may be applied in the same type of conditions where penicillin could be employed. Erythromycin is fully active orally, however, but it is not administered widely by injection.

The antibiotic has been used in a variety[10,11] of conditions, largely those of the respiratory and urinary tracts. Literature reports successful use in early encephalitic syndromes, that is, distemper-caused nervous conditions in dogs prior to actual convulsions. An author has reported a total of 14 cases treated by this method[10].

Dose of erythromycin in dogs has been in

(*Continued on page 466*)

Some Neoplasms Of Zoo Animals: A Report Of Selected Cases†

W. C. OSMAN HILL,* M.D., JAMES R. WADSWORTH,** V.M.D., RICHARD S. WOODRUFF,*** M.D.

WITHIN the last three decades, Fox,[1] Ratcliffe,[2] Feldman,[3] and Willis[4] have made notable contributions to the study of neoplasia in captive wild mammals and birds. Schlumberger's[5] work with tumors in the parakeet is a classic. During more recent years, a wide variety of case reports on neoplastic diseases in wild species has been published. Louw[6] described a carcinoma in a liger. A probable leiomyosarcoma in a lion at the Racine Zoological Park (North Dakota) was reported by Krohn *et al.*[7] Recently, Hackel *et al.*[8] described an adenocarcinoma of the thyroid gland in a bear. Rewell,[9] former pathologist for the Zoological Society of London, mentioned a case of fibromyomatosis of the uterus in an aged Squirrel Monkey. A spindle-cell sarcoma of the mandible in a Black Leopard was reported by Hill[10]. Metastasis resulted in secondary invasion of the maxilla with complete destruction of the temporo-mandibular articulation. Habermann *et al.*[11] published an interesting report, describing spontaneous hepatomas in woodchucks as well as an embryonal carcinoma (seminoma) of the testis in a badger. Wadsworth[12] reported a case of fibrosarcomatosis in a pregnant deer. A variety of neoplasms in mammals and snakes have been published by Wadsworth,[13] and Hill[14] mentioned a carcinoma of the poison gland in a Black-and-white Cobra. Finally a lymphosarcoma in the intestine of a Koala bear has been described in detail by Millar and Tucker[15].

The following report describes five malinnant neoplasms in mammals and birds from the collection at the Zoological Society of London.

An eight-year-old male leopard (*Panthera pardus*) suddenly began to hemorrhage from a self-inflicted wound of the right hind foot. The animal was robust, heavily muscled, but overfat. Clinical examination of the beast revealed a flattened, ovoid tumor in the extensor tendon sheath of the right foot distal to the above mentioned wound. Due to the pain arising from the tumor, it was concluded that the animal had been attempting to amputate his own foot. The growth was firm, while the cut-surface disclosed hemorrhagic and necrotic areas. Microstudies revealed sarcomatous cells, together with areas of hyaline degeneration and necrosis. The tissue was extremely

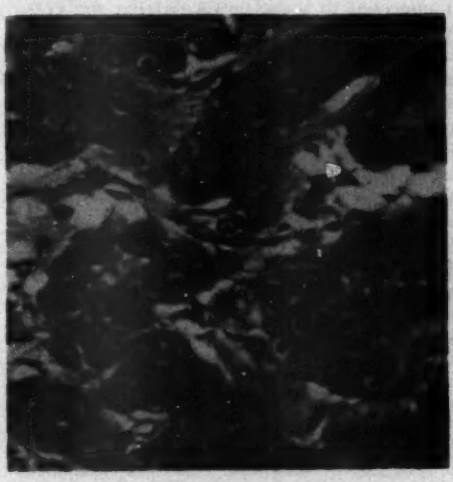


Fig. 1. Malignant epithelioma in a Pennant's parakeet. (X 450).

anaplastic and many of the cells were distinctly of the fibroblastic variety. Other cells were round or ovoid, possessing large nuclei with prominent nucleoli. A tendency for the cells to grow around thin-walled spaces was evident. Diagnosis: Malignant synovioma.

Another malignant neoplasm involved a six-year-old female Oriental Jackal (*Canis aureus*) born at the Calcutta Zoo. The animal was reasonably well nourished and in fair pelage. Necropsy revealed a myxomatous, pear-shaped, encapsulated mass about one-inch in diameter

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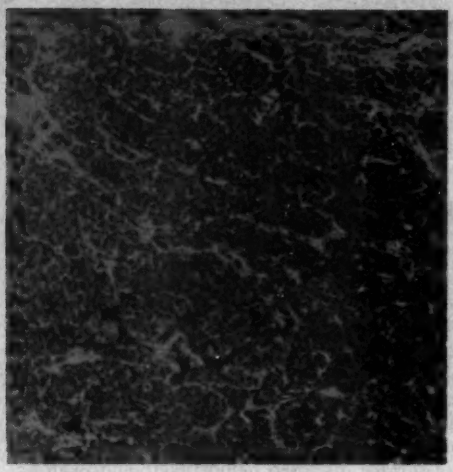

Fig. 2. Primary hepatoma in a Leadbeater's Cockatoo. (X 120).

located between the skin and bone of the skull. It appeared to grow upwards from the cribiform plate of the ethmoid out of the frontal sinus. A probe was passed from the center of the mass into the frontal sinus. Histopathological studies showed a matrix of myxomatoid tissue, which appeared degenerated. The cells were spindle-shaped, some of which were arranged around small blood vessels. The possibility of the tumor being a fibrosarcoma became apparent. However, due to its location and structure, we preferred to designate it as a possible meningioma. Such neoplasms are locally malignant. Diagnosis: Undifferentiated tumor of degenerated myxomatous tissue; possible meningioma.

The third mammalian neoplasm occurred in a female Binturong (*Arctictis binturong*). The animal had been in the menagerie for a little over two years, and was killed by order, due to progressive weakness. She was emaciated, yet in good pelage. Vulva was swollen, the mucous membranes pale, and distinct, irregular nodules were palpable in the ventral abdominal area. Autopsy revealed glandular tumor masses on either side of the midline, apparently in association with the mammary glands. Metastatic nodules were observed in the parenchyma of the liver and spleen. The cervical lymph nodes likewise were involved. In addition, secondary tumor deposits were noted on the right side of the spinal column opposite the 11th and 12th thoracic vertebrae. Micropathological studies revealed infiltrative carcinomatous cells lining alveoli, and extending into adjacent tissue. Many nests of tumor, parenchymatal cells were noted. Diagnosis: Mammary carcinoma with widespread metastases.

Two interesting neoplasms involved exotic birds. The first occurred in a male Pennant's Parakeet (*Platycercus elegans*), which had been at the London Zoo for nearly 11 years. It died of senility. Antemortem studies revealed a considerable swelling of the right tibia, covered with an extensive layer of congealed, hemorrhagic exudate. Necropsy disclosed a large, opaque, yellowish-white tumor of the right tibial region, which was partially embedded in the adjacent musculature. Microstudies showed widespread aggregations of cell-masses on a fibrous matrix. Infiltration into the muscle tissue was apparent. The cells stained deeply basophilic, and the glandular acini present were considered to be pseudoacinar in type, due to the absence of either sweat or sebaceous glands in fowl. The authors were confronted with two possible diagnoses. The lesion was considered to be either an adenoid type of basal cell carcinoma or a malignant epithelioma. The latter diagnosis was finally adopted. Diagnosis: Malignant epithelioma (fig. 1).

Malignancy resulted in the death of a female Leadbeater's Cockatoo (*Lophochroa leadbeateri*). The bird had been in the collection for 20 years. Clinical examination showed her to be cachectic with a tense and protuberant abdomen. Several points of bleeding occurred along the cloacal margins. Autopsy revealed marked ascites. The liver was grossly enlarged and its substance replaced by opaque tumor tissue. A mesenteric tumorous mass also was disclosed, to which the intestinal coils were firmly adhered. Histopathological studies revealed a typical hepatoma. The hepatic lobules were packed closely with numerous, large, polyhedral cells of the acidophilic variety. These cells resembled the hepatic cells but the normal histology of the liver was lost. Transitional areas were noted, in which the cells seemed to be intermediate between normal hepatic cells and neoplastic cells. Mitoses were apparent. Diagnosis: Primary hepatoma (fig. 2).

Summary

Five, malignant neoplasms of captive wild species have been described. The pathology of zoo animals represents a distinct and important part of the broad study of morbid processes. It is hoped that both physicians and

(*Continued on page 466*)

Response of the Syrian Hamster to the Saukett (Leon Type) Strain of Poliomyelitis Virus after Various Routes of Exposure

REGINALD L. REAGAN,* Major, Ret. U.S.A.
and A. L. BRUECKNER,** V.M.D.,
College Park, Maryland

The study was undertaken in order to determine whether the Syrian hamster is susceptible to the Saukett tissue culture strain of poliomyelitis by various routes of exposure. The intracerebral and intrarectal routes were reported in previous papers,[1,2] but also are repeated here with the other routes of exposure.

Materials and Methods

The tissue culture Saukett strain of poliomyelitis virus used in this experiment was supplied by Doctor Salk and Doctor Bennett of the University of Pittsburgh. The pooled virus had been propagated in monkey kidney tissue cultures for ten passages; $l.d._{50}$ in rhesus monkeys by intracerebral injection was $10^{-6.5}$ to 10^{-7}.

Experimental

Sixty sixteen-day-old market Syrian hamsters were divided into ten groups of six hamsters each. Each group was inoculated with the Saukett poliomyelitis tissue culture strain by one of the following routes: Intracerebral, intraperitoneal, intranasal, intralingual, intrarectal, intramuscular, intracardiac, intraoral, intradermal, aand intraocular. The cerebral, lingual, nasal, and ocular groups received 0.03 ml. each. The hamsters of the other groups all received 0.1 cc. each. Following exposure to the virus, the hamsters of all groups were kept in separate glass animal jars. Each jar was covered with a fine wire mesh lid. The hamsters were given water daily and fed several pellets of the commercial dog or mouse checkers. They were checked three times daily. All hamsters were held 21 days for observation and discarded (except those exhibiting symptoms of nervous system involvement.) Results are given in table 1.

TABLE 1. Response of the Syrian Hamster to the Saukett Tissue Culture Strain of Poliomyelitis Following Various Routes of Inoculation

Route of Inoculation	No. Exposed	No. Showing Symptoms	Inoculation Time
Intracerebral	6	4	6-10 days
Intradermal	6	0	
Intraperitoneal	6	0	
Intranasal	6	0	
Intrarectal	6	3	6-10 days
Intramuscular	6	0	
Intracardiac	6	0	
Intraoral	6	0	
Intralingual	6	0	

*Professor of Virus Diseases.
**Professor and Director of L.S.S.S., Virus Laboratory, Live Stock Sanitary Service, University of Maryland.

TABLE 2. Response of the Syrian Hamster Groups to Neutralization Tests Conducted

Group for Neutralization Study	Result
1. Intracerebral group	Confirmed to be the Saukett strain of poliomyelitis in both groups by neutralization tests conducted in young hamsters using Saukett antiserum.
2. Intrarectal group	

Results

Six to ten days postinoculation, hamsters from the intrarectal and intracerebral group exhibited signs of central nervous system involvement, paralysis, and death.

The brains from each of those of the positive groups were recovered separately; each group was pooled and the brains ground with alundum and made into a 20% suspension with physiological saline. Neutralization tests using Sauket antiserum were conducted. (The Saukett antiserum also was provided by the Poliomyelitis Research Center.) These neutralization tests on each positive group identified the virus as Saukett strain of poliomyelitis. The results are given in table 2. Hamsters typically affected showed symptoms of irritability and malaise, followed by paralysis.

Summary

Syrian hamsters were exposed intracerebrally, intrarectally, intranasally, intracardiac, intraperitoneally, intradermally, intramuscularly, intraocularly, intraorally, and intralingually to the poliomyelitis virus (tissue culture, Saukett strain). Only the intracerebral and intrarectal groups showed poliomyelitis symptoms. The virus in these groups was confirmed to be the Saukett strain of poliomyelitis virus by neutralization tests conducted in hamsters.

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Neomycin and Erythromycin

(*Continued from page 462*)

the order of 300 to 1200 mg. daily in divided doses, orally.

Summary

Neomycin is a broad-spectrum antibiotic currently being used in treatment of bovine mastitis, infectious dysentery of large and small animals, and certain topical infections of the eyes, ears, and skin. Neomycin-hydrocortisone and neomycin-kaolin-pectin combinations are particularly useful in veterinary practice.

Erythromycin has bactericidal effects, primarily against Gram-positive organisms. It has been used in small animals to treat respiratory infections, urinary tract infections, and early encephalitic symptoms.

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Correct diet is the key to preventive medicine—*Mark L. Morris D.V.M.*

Vitamin-Mineral Supplementation for Show Dogs

By pairing 30 dogs on the basis of general condition, quality of hair coat, et cetera, Mr. Robert S. Kendrick was able to demonstrate the plus value that may be expected from vitamin-mineral supplementation of diets ordinarily fed dogs being conditioned for show.[89]

Pairs of dogs were managed and fed exactly alike except that pervinal® vitamin-mineral supplement was added to the diet of one of each pair. Obvious improvement was noted after one month. Pervinal-fed dogs, underweight at the beginning of the experiment, gained satisfactorily and exhibited tone and bloom lacking in paired dogs.

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Neoplasms of Zoo Animals

(*Continued from page 464*)

veterinarians alike will show an increasing interest in the diseases of zoo animals.

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EDITORIAL COMMENTS

A.V.M.A. Minneapolis Convention

Annual meetings of the American Veterinary Medical Association climax association activities for the preceding 12-month period. The Minneapolis convention which convened on August 15 and closed August 18, 1955 summarized, during the sessions of its specialty sections, as has become customary, advances made in the science since the previous meeting. In addition, new goals were set and plans prepared to handle problems posed and anticipate challenges the profession might be called upon to face.

The notable achievements during recent years are too numerous and broad in scope to recount in detail here but suggestion of the influence of organized veterinary science on society today, compared with earlier years, was brought out in the address by Dr. H. C. H. Kernkamp at the opening session. He also referred to the numbers of participants and size of registration at previous meeting held in Minneapolis (1902-1928). Total registration at this meeting exceeded 3,700, surpassing all previous attendance records.

Facilities at the Minneapolis Auditorium provided ample space for general and sectional meetings, television studio, and commercial and educational exhibits. Visitors were quartered in a number of hotels, some of which were separated by more than walking distance. The inconvenience caused by the lack of hotel facilities of sufficient size to accommodate all at one place was accepted as inevitable considering the growth and numbers now attracted to various features of the annual convention.

Preconventional conferences of groups within the A.V.M.A. structure were held prior to the official opening, and at luncheons, and in evenings during convention week. Some 33 of these separate group meetings were held at various locations and times. New among these this year was the organization meeting of the American Association of Veterinary Nutritionists. The work of committees, the Board of Governors, Executive Board, and House of Representatives was concluded during the week preceding the official opening.

President of the A.V.M.A.

Dr. Floyd Cross

Dr. Floyd Cross, dean of the School of Veterinary Medicine, Colorado A. & M. College, Ft. Collins, was installed as president in ceremonies at the closing general session of the 92nd annual meeting at Minneapolis, Minn. Doctor Cross was elected in 1954 by ballot vote at Seattle, Wash.

Doctor Cross has been a member of the Colorado A. and M. faculty since 1915, when he was appointed assistant professor of veterinary medicine. His appointment came shortly after his graduation from the school which he attended from 1910 to 1914.

His career was interrupted for military service in World War I which covered nearly a four-year period (January 1916 to September 1919), 23 months of which was spent in France. He was discharged as a 1st Lieutenant, Veterinary Corps.

After returning to his college, Doctor Cross was promoted to associate professor in veterinary pathology, professor of veterinary medicine and head of the department in 1935. In 1935, he also became dean of men. Subsequently he was named head of the Department of Pathology and Bacteri-

ology and became dean of the School on March 1, 1948, succeeding the late Dr. I. E. Newsom when the latter was made president of the college.

Doctor Cross is known widely for his research work in animal diseases, particularly those common to feedlot conditions. He is the author of numerous papers, articles, and bulletins which have contributed to reduction of livestock losses. His cooperation, understanding of problems of producers, and close association with livestockmen in Colorado has earned for the school and himself the esteem of all livestock interests of the Rocky Mountain region.

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President's Address

President A. H. Quin referred in his opening address to the potentials for growth of the profession. He stated that approximately 1,000 counties in the United States and Canada offer economically sound opportunity for private practice. Many other areas exist where qualified professional service could not now be considered because of sparse settlement. He also called the attention of his listeners to facts relating to future requirements for livestock products to feed a rapidly increasing population. Migration to suburban areas from many great metropolitan areas has also increased demand for service to pets of suburbanites. Other opportunities were mentioned that have developed with new trends in modern living.

Referring to an immediate need, Doctor Quin emphasized the importance of research and the facts related to limited allocation of federal and state funds to support research vitally needed from the aspects of national economics. He called for a Congressional authorization, under the provisions of the Bankhead Act, to establish adequately staffed and separate regional laboratories for research into the disease of all classes of meat-producing animals, and urged action toward accomplishment of this objective.

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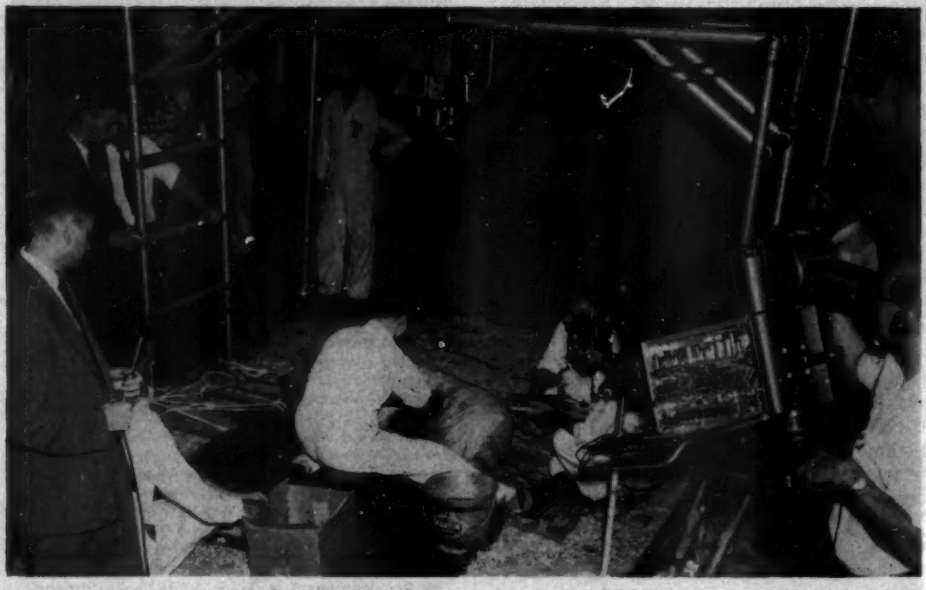
New Officers for 1955-56

Dr. Floyd Cross, dean of the School of Veterinary Medicine, Colorado A. & M. College, Ft. Collins, was installed as president at the closing session. Brigadier General Wayne O. Kester, USAF(VC), Chief of the Veterinary Corps, U. S. Air Force, Washington, D. C., was elected president-elect.

Six Vice-presidents elected include: Dr. J. R. Krichel, Keokuk, Ia., Dr. Oscar Sussman, Princeton, N. J., Dr. M. R. Blackstock, Spartanburg, S. C., Dr. John D. Stevens, Sequim, Wash., and Dr. A. Grant Misener, Chicago, Ill.

The Board of Governors, acting for and under the direction of the Executive Board, re-elected the present incumbents for the positions of executive secretary, assistant executive



Television studio, large animal clinic. Note overhead camera for close-up view of operative field. Dr. L. E. Fisher, coordinator, left foreground.

secretary, and editor of A.V.M.A. publications for the coming year. Dr. H. E. Kingman, Jr. was reelected treasurer.

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Scientific Programs

All scientific discussions were classified and presented before one of six sections of the convention. These were designated: General Practice, Research, Small Animals, Poultry, Surgery and Obstetrics, and Public Health. Each section was conducted by officers selected at the Seattle meeting in 1954. Television demonstrations were presented at two of the three sessions devoted to section on General Practice, Small Animals, and each of the two sessions of Surgery and Obstetrics. These carefully prepared and rehearsed presentations, coordinated expertly by Dr. L. E. Fisher, highlighted the entire program and attracted the largest audiences. Again this year the feature was made possible by the generous support of Allied Laboratories, Inc., in cooperation with the Radio Corporation of America.

Mucosal Diseases of Cattle

Dr. W. R. Pritchard, Lafayette, Ind., included a group of diseases of cattle recently described as the mucosal diseases. These include virus diarrhea, infectious rhinotracheitis, upper respiratory disease, and mucosal disease. He stated that the syndrome similar to all of this group of maladies had spread to 20 states since 1951. Incidence appears to be increasing in the Corn Belt, reaching heights during winter months, particularly among young animals. Results of studies suggest a virus causative agent which has been shown to be transmissible. He pointed out that some symptoms and lesions were, in many instances, similar to those of epizootic enteritis and rinderpest, exotic conditions not proved to exist in the United States.

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The procedure of marketing all old birds at the end of their first production year has merit in eradicating avian tuberculosis. One must bear in mind, however, that pullets also may have tuberculosis and be a source of dissemination of the disease to pen mates or to swine. The threat of tuberculosis remains as long as a single infected bird remains on the farm.—*C. D. Lee, D.V.M.*

General Kester Elected President-Elect

Brigadier General Wayne O. Kester

Brigadier General Wayne O. Kester, USAF(VC), Chief of the Air Force Veterinary Service, Washington, D. C., was unanimously elected as president-elect at the opening sessions of the Minneapolis meeting.

General Kester was born on a Nebraska farm August 27, 1906 near Cambridge where he received his elementary education. He attended the Nebraska State Teachers College at Chadron for his preveterinary training and completed requirements for his D.V.M. at Kansas State College in 1931.

After two years in private practice in Manhattan, Kansas and Akron, Ohio, he was commissioned second lieutenant in the Army Veterinary Corps as a result of successful completion of entrance examinations. His service dates from July 1933. Assignments to duties at military establishments and training schools followed in succession. These ranged from duties with mounted troops to staff and advisory positions in organizations concerned with food inspection and sanitation. At the time of the outbreak of World War II, he was assigned as port and depot veterinarian in the Hawaiian Islands. He was at Pearl Harbor during the Japanese attack on the islands. During the war he served as chief veterinarian, U. S. Forces, Pacific Ocean Areas and simultaneously as staff advisor to the Military Governor and later Governor of Hawaii.

In July 1949, General Kester was transferred to the Air Force and assigned to the Office of the Surgeon General as director of the newly established Air Force Veterinary Service, a position he still holds. Under his direction a comprehensive and unique veterinary service has been developed as an integral portion of the Air Force Medical Service. His approach in developing services for which veterinarians are especially trained to

perform, and in establishing the position of veterinary science on the military public health team has greatly broadened the concept and scope of military veterinary medicine. Trends and practices initiated by the Air Force under General Kester's influence have set a pattern in the health fields. Better understanding and recognition of the role of veterinary science has resulted. He received special commendations from higher authority for his accomplishments in the development of military veterinary medicine and public health.

An active horseman all his life, General Kester has participated in many equestrian events and served as horse show and trail horse judge. He retains a keen interest in the livestock industry and owns a commercial beef herd in western Nebraska.

He married his college sweetheart, Inez M. Hill, a graduate of Kansas State College in 1933.

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Calfhood Vaccination Encouraged

The special Committee on Brucellosis of Cattle called for continuation and expansion of the calfhood vaccination phase of the brucellosis eradication program. They also expressed hope that research will reveal feasibility of modifying age limits recommended for vaccination to between four and ten months of age. This step, and the possibility of additional modification of the interpretation of the seroagglutination test, if indicated by further research, may be expected to advance further the program of complete eradication.

Funds provided by the 83rd Congress to assist states in the control programs made it possible to awaken interest in further efforts in the direction of eradication. Procedures followed, including wide use of the milk ring test and utilization of the services of local practitioners has resulted in significant increases in the number of tests completed and calves vaccinated.

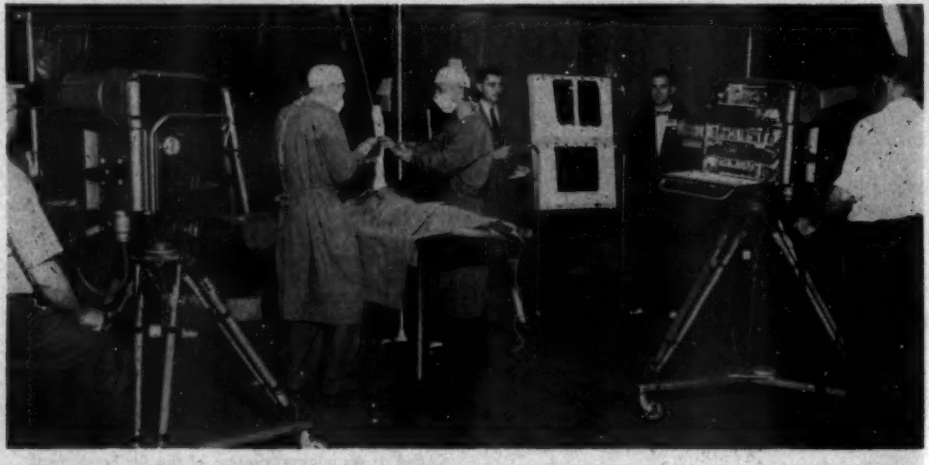
Foreign Diseases an Ever-Present Threat

Fantastic and exaggerated statements published in many types of publications concerning the threat of biological warfare (BW) has tended to overshadow the ever-present, and perhaps most hazardous, threat of accidental introduction of foreign animal diseases, according to Dr. Frank A. Todd, special assistant to director, Agricultural Research Service. About 95% of poultry, 75% of horses, and a large number of cattle and zoological specimens come to this country via air transportation. This means that the time factor involved can be measured in hours instead of days and weeks. It may be seen how the time barrier against foreign diseases has been removed effectively.

Safety of Drugs Added to Feeds

The burden of proof that addition of drugs to animals' feeds will not in some manner, be deleterious to consumers rests squarely upon the proponents for the use of these chemicals regardless of the purpose for which they are recommended, according to Dr. John H. Collins, Food and Drug Administration, Washington, D. C.

Many of the drugs or chemicals recommended are highly potent compounds capable of producing profound change in structure or



General view of the television studio for the small animal clinic. Photographed during presentation of surgical demonstrations.

function even in minute amounts. Possibility of residual quantities or adverse accumulative action make necessary most thorough and exhaustive investigation. Refusal to make application for additions effective may be anticipated, in the absence of proof, that final products for human consumption are free from any poisonous properties.

Control and Prevention of Bovine Leptospirosis

Abortions, poor breeding efficiency, and death losses follow attacks of leptospirosis in cattle. These losses are detected easily and are felt keenly by livestock owners. Dr. H. S. Bryan, College of Veterinary Medicine, University of Illinois, stated that the disease is being recognized with increasing frequency, if indeed infection is not spreading more rapidly than previously. He also stated that effects on reproduction are serious.

Control and prophylactic measures recommended by the speaker were as follows:

1. If leptospirosis is suspected, obtain an accurate diagnosis.

2. Use only bulls with a negative leptospirosis blood test.

3. Exercise extreme caution when purchasing replacement stock.

4. Retain and rebreed aborting cows. Survivors usually possess strong immunity.

5. Vaccinate susceptible animals as a means of slowing down or stopping spread of the disease in affected herds.

6. Maintain cattle, swine, and other domestic animals separately. Swine play a significant role in the spread of leptospirosis.

7. Prevent contamination of feed and water supplies.

8. Exercise caution in handling infected animals. Disease is transmissible to man.

Of 10,000 cattle tested in 725 herds in Ohio, Dr. E. H. Bohl, Ohio State University, reported that 4.12% of individual animals were positive for bovine leptospirosis and that 26.7% of the herds contained one or more reactor animals.

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Internal Parasites of Swine

Continued interest in problems posed by parasites has been created by pointing out hidden losses directly attributable to them. It has been emphasized that losses suffered from growth delay and poor feed conversion are most costly of all. However, losses due to condemnation of carcasses ultimately must be assumed by growers. It is reported that as many as 8% of swine carcasses condemned for all causes under federal inspection were condemned because of icterus associated with the presence of ascarids in the bile ducts and liver. In one packing establishment, condemnations for this cause at times have amounted to 50 to 75% of all carcasses.

Dr. A. C. Todd, parasitologist, University of Wisconsin, Madison, stated that parasitic infections are subclinical; overt signs of disease are lacking. In view of these facts, the ascarid control program recommended for swine by the Wisconsin Experiment Station requires that pigs be wormed every 50 days following birth. This is based on the fact that all pigs are exposed to, and infected by, *Ascaris lumbricoides*, which is known to require 60 days to mature.

Drugs in common use during recent years include sodium flouride, which has proved immensely valuable, and more recently two cadmium preparations (cadmium oxide and cadmium anthranilate) have proved effective and safe. Piperazine compounds lately have demonstrated equal efficacy with a greater safety margin.

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Educational Exhibits

The scientific exhibit, "Veterinary Aspects of Atomic Warfare" sponsored by the Veterinary Corps, U. S. Army, was awarded first place by the committee assigned to judge the respective merits of a fine group of displays that attracted much interest.

Second place was won by the exhibit, "The Care of Laboratory Animals" presented by the American Veterinary Medical Association which emphasized the interest of the profession in the care of animals used for experimental purposes. It points out that, "The accuracy of research involving animals is directly related to the health of the animals employed in the research. Hence, the production, management, and use in research of living animals requires the care of personnel having specialized training".

"Public Health Aspects of Animal Ringworm" designated the third place winner, was a display prepared by the Communicable Disease Center, Atlanta, Ga. In this was shown types of animal ringworm which are transmissible to man and thus have public health significance.

AWARDS

XII International Veterinary Congress Award

Dr. Bennett T. Simms, director, Animal Disease and Parasite Research Branch, Agriculture Research Service, USDA, Washington,

Dr. Bennett T. Simms

D. C., was awarded the XII International Veterinary Congress Prize at the opening session.

This award was established in 1936 to recognize outstanding service by a member of the A.V.M.A. to the profession. Cited was Doctor Simms' unselfish devotion to veterinary science in the several capacities of his career. Special emphasis was given to his research work at the Oregon Experiment Station and at the Regional Research Laboratory at Auburn, Ala. Also cited was his distinguished work as chief of the now replaced Federal Bureau of Animal Industry (BAI) that contributed so much, as an organization, to the American livestock industry for so long.

Doctor Simms is a past president of the A.V.M.A. (1946-47) and has served the national association as a member of its Executive Board and Committee on Education.

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A.V.M.A. Award

"Meritorious service to the membership", basis for the annual A.V.M.A. award was presented Dr. C. W. Bower, practitioner of Topeka, Kans. He is the sixth recipient of this coveted award (established in 1931) in recognition of his services during a brilliant career of devotion to organized veterinary medicine.

In presenting the award to Doctor Bower, President Quin pointed out a long list of activities considered above and beyond the call of duty. He served as president of the A.V.M.A. (1943-44), president of the A.A.H.A. (1954-55), president of the Missouri Valley and Kansas Veterinary Medical Associations. He also served as secretary for the Kansas association for many years, and on numerous

Dr. C. W. Bower

councils, boards, and committees of the national association. He is active presently as president of the National Board of Veterinary Medical Examiners, working toward problems of national veterinary examination and licensure procedures. He is also secretary of the Kansas State Board of Veterinary Registration and Examination.

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Borden Award

The Borden Award, medal, certificate, and cash honorarium of $1,000., offered each year

Dr. H. E. Kingman, Sr.

since 1944 by the Borden Company Foundation to recognize and encourage outstanding research achievements in the control of diseases of dairy cattle, was presented Dr. H. E. Kingman, Sr. of Mineral Bluff, Ga.

Citation included reference to Doctor Kingman's work in the field of reproduction in cattle, infertility, artificial insemination, and other phases concerned with breeding efficiency in this species. He also was commended for contributions to surgical and clinical technics while serving as chief surgeon of the Division of Veterinary Medicine, Colorado A. & M. College, Ft. Collins, and as veterinarian for the Wyoming Hereford Ranch, Cheyenne.

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Humane Act Award

Rescue of a dog, shown in the accompanying illustration, from a lightly frozen lake earned for ten-year-old Martha Ann Coppedge, Portsmouth, Va., the annual A.V.M.A. award

Martha Ann Coppedge and "Buff" whose life was saved by heroic actions of the girl.

for humanitarian service. The award consists of an appropriate certificate and a $100 U. S. Savings Bond, and official national citation.

The story of Martha Ann's courage and consideration for helpless animals is typical of American boys and girls and several additional certificates were presented to recognize others, many of whom performed meritorious acts of kindness to animals referred for the attention of the Committee on Awards.

Martha Ann waded, then swam, toward the floundering dog unable to negotiate the frozen crush of lake ice. Her efforts saved the pet's life.

The Gustavus Franklin Swift Founder Award and a bronze plaque were presented to the A.V.M.A. by Dr. H. E. Robinson, director of laboratories for Swift & Company, Chicago.

In presenting the award, Doctor Robinson pointed to professional measures that have contributed to healthier livestock. Livestock owners and consumers have benefited immeasurably as a direct result of the application of veterinary science to problems concerned with the maintenance of health of meat-producing animals.

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USDA Offers New Job Opportunities for Veterinarians

Recent legislation raising salaries in the Federal Civil Service has resulted in attractive new job opportunities for beginning veterinarians. Starting salaries for government work are now $4,930. a year and up.

The Agricultural Research Service of the U. S. Department of Agriculture announces that it has openings for veterinarians at Civil Service grades GS-7 and GS-9 in meat inspection work and livestock disease control and eradication activities. These positions are open in many locations throughout the country.

Applicants with at least one year of professional veterinary experience may be appointed initially in grade GS-9 at $5,440. per year. Those with less than one year's experience are appointed in grade GS-7 at $4,930. per year, and after satisfactory completion of six months' service and training they have excellent opportunities for advancement to grade GS-9 at $5,440.

Qualified veterinarians interested in employment at grades GS-7 and GS-9 are encouraged to write to the Personnel Division, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C., or to contact their nearest Inspector in Charge of Federal Meat Inspection or Veterinarian in Charge of Federal Livestock Disease Control and Eradication Work or other veterinary activities of the Agricultural Research Service.

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The use of virulent hog cholera virus is now banned in three states—Alabama, Tennessee, and Georgia. The last named is the third state to enact restrictive legislation.

Practice Problems Peculiar to the South to Feature Combined Southern-Florida Meeting

The program chairmen of the Southern Veterinary Medical Association and the Florida State Veterinary Association have announced details for the combined Florida-Southern meeting to be held at the George Washington Hotel, Jacksonville, Fla., October 16-19, 1955.

Extensive preparations have been made to entertain all members and their families of both associations. A record attendance is expected because of interest in program material and the excellence of facilities in the host city.

Speakers have been selected from national authorities on problems which are present chief concern of practitioners in the South. Much lecture material will be illustrated. Panel discussions arranged will serve also to assist in specific problems facing individual practitioners or groups.

This is the first time that Florida veterinarians have been hosts for the Southern, and the combination promises to excel.

Those planning to attend this meeting are urged to make hotel reservations early. Accommodations at either the headquarters or nearby hotels are excellent. For further details address Dr. A. A. Husman, 320 Agricultural Bldg., Raleigh, N. C., secretary for the Southern, or Dr. Robert P. Knowles, 2934 N.W. 17th Ave., Miami, Fla., secretary for the Florida Association.

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Antibiotic Growth Stimulation

Degradation products of penicillin breakdown appear to furnish the growth stimulation of this antibiotic according to report by British scientists (Taylor and Gordon, *Nature*, August 13, 1955).

When rations of test pigs were supplemented with small quantities of inactivated penicillin, growth benefits were essentially the same as when active penicillin was added. Other test pigs responded similarly to injections of the inactivated antibiotic. The nature of the ingredient responsible for growth boost has not been determined for certain, but the authors claim that it probably is an amino acid, penicillamine.

The antibiotic's action on microorganisms is not responsible for growth stimulation according to these researchers.

Labor Cost of Livestock Production

Labor study conducted by the Agriculture Research service reveals that farm wages have quadrupled since pre-World War II while labor requirements for livestock production were cut only 7%. Crop labor costs were cut 34% during the same period.

Economist R. W. Hecht, who made the study, found that it required 61.7 man-hours to produce $100. worth of milk. This covers only labor directly applied to milk production such as feeding, milking, hauling feed, cleaning barns, and moving and disposing of animals and their products. This figure is compared to 45 man-hours to produce $100. worth of eggs, 11.9 man-hours for $100. worth of broilers, 26.8 man-hours for sheep, and 23.8 man-hours for turkeys, 15.9 man-hours for hogs, and 15.8 man-hours for beef cattle.

Need for reducing labor cost in livestock production is a great challenge to agricultural research.

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Western Migration of Packers

Recent announcement that Wilson & Company would cease slaughtering operations in Chicago fits into the trend of migration and decentralization of the meat packing industry. It is understood from general news sources that only general offices and the pharmaceutical operations of the Wilson Company will remain in Chicago. Slaughtering will be increased at more western plants located at Albert Lee, Minn. and Cedar Rapids, Ia. Other large meat packing concerns have taken similar action.

Reason given largely concerns transportation costs to great central markets for live animals from farms where they are raised and fattened. Other economies also are involved, as well as shifts in methods of transportation (rails to roads). These matters, combined with modern developments of handling and processing equipment in newer established plants, make western migration of meat processing an economy measure for an industry long known for its low profit margins on gross sales.

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Milk-borne epidemics of human leptospirosis have not been recorded but it appears possible that unpasteurized milk from infected herds might be the source of human infection.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Cryptorchism in Dogs

Recently we were asked to examine a yearling, male Dobermann-Pinscher with only one testicle in the scrotum. The ectopic testicle could not, by a cursory examination, be reached by palpation of the inguinal region. This dog, a magnificent animal, lately had been disqualified at a dog show because of the above mentioned condition.

Geneticists generally hold that failure of a testicle to descend into the scrotum is a recessive factor, and that when the gene is present in a family, it may appear later in the offspring. In other words, this animal or immediate offspring or near relatives were genetically "unclean" and, if used for breeding purposes, there would be either crytorchids or "carriers" among them. It may be questioned, but it does appear that if this inherited, recessive factor is present in a certain family, the best way to eliminate it as a breed characteristic is to discontinue, for breeding purposes, the visibly affected animal, the immediate sire, dam, and litter mates. Cryptorchid dogs, as well as other animals, not infrequently mature as erratic, vicious, and sometimes feminized individuals. Usually, the undesirable features are ascribed to a disturbed hormonal balance, and also that the hidden testicle is subjected to a higher temperature than normal for it. Scrotal temperature is usually one or two degrees lower than body temperature.

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Toxicity of Chlordan

In regard to chlordan, an insecticide used frequently on animals, a report of the Council on Pharmacy and Chemistry of the American Medical Association (published in the *Jour. Am. Med. Assn.*, August 13, 1955) states it is one of the more hazardous of the chlorinated hydrocarbon insecticides. The exact nature of chlordan is not thoroughly known. It is readily absorbed through the unbroken skin, and by inhalation. Pulmonary edema and gastrointestinal irritation are outstanding postmortem findings. Several persons are known to have succumbed to the absorption of this insecticide.

Cat Scratch Fever

Cat scratch disease which is usually considered to be a benign reticuloendotheliosis occasionally is accompanied by severe neurological disturbances as evidenced by reports appearing in medical publications. Cutaneous erythema, pulmonary infiltration, and other manifestations are at times mentioned as occurring in this condition. In suspected cases in man, a diagnosis may be confirmed usually by a positive endermal reaction to a cat-scratch antigen, which remains quite pronounced for some time following subsidence of acute symptoms. If a veterinarian, during the course of his practice, learns of a person with deep or multiple cat scratches and nervous symptoms, he should advise prompt handling by a physician.

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Calf Scours

This may not be the best time of the year to discuss calf scours as most practitioners are well aware of the fact that bovine births taking place away from farm animal habitations, or drainage from such habitations during the warmer seasons and in areas that receive a maximum daily sun exposure show a sharp drop in scours as compared with indoor or winter conditions of birth. The foregoing emphasizes the value of sanitary surroundings. Furthermore, scours is practically nonexistent if the calf, following an outdoor birth and during the immediate postnatal period, ingests freely of the dam's colostrum within four hours after its birth. During the colder seasons, colostrum and sanitation are remarkably effective. Without sanitary surroundings colostrum fails as it is not able to cope with the mass infections of unsanitary environment exposure. In the earlier stages of scours, withholding milk from the diet and substituting cracked barley water plus an appropriate sulfonamide and an antibiotic are the recommended methods of handling. Prevention by assuring available colostrum and sanitation are the most important steps.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Humane Slaughtering Technic for Turkeys

Carbon dioxide immobilization of turkeys before slaughter is the subject of USDA Circular 958. The authors, Drewniak, Baush, and Davis concluded that turkeys can be immobilized effectively with carbon dioxide when proper combinations of gas concentration and exposure time are used. Under the conditions of their experimentation, carbon dioxide gas given in concentrations of 73 and 77% was within the practical limits of use and 75% appeared to be optimum.

Within a variety and sex, the lightweight birds immobilized more quickly than the heaver ones. The exposure time for immobilization varied from 50 to 110 seconds. As examples, Broad Breasted males were immobilized in 80 to 110 seconds; BB hens in 50 to 75 seconds; White Holland males in 65 to 85 seconds; and W H hens in 55 to 80 seconds. Turkeys in their normal upright position were immobilized more quickly than those in an inverted or shackled position.

The investigators noted a number of interesting reactions in turkeys exposed to carbon dioxide gas. In general sequence they were: Shaking of the head, inability to stand, increased depth of breathing, dorsiflexion of the head, collapse, increased rate of heart pulsation, closure of the eyes and unconsciousness. Wing spasms, violence, and death followed lethal concentrations. The changes in appearance of the bird during treatment included a change of the characteristic red color of the head, wattles and neck to a bluish white. As would be expected, the blood of the treated bird changed from the normal bright red to deep blue to purple.

Turkeys immobilized by carbon dioxide, bled and processed in the usual manner and carefully inspected after evisceration showed no detrimental effects as a result of treatment. The investigators made no comments on this technic as a recommended routine procedure for use in processing plants. Their results indicate that, with development of suitable processing methods, gas immobilization would be feasible.

Experimental Avian Leptospirosis

In two papers, Bryne, Jahnes, and Gleiser, and Gleiser, Jahnes, and Gleiser (*Cornell Vet.*, 45:290 and 296, 1955) report on the use of chicks, embryonated chicken eggs, and embryonated duck eggs for diagnosis and research studies of leptospirosis. They were successful in producing a leptospiremia which lasted for as long as 28 days by injection of *Leptospira canicola* into day-old chicks. The chicks remained asymptomatic but did respond to infection by producing measurable agglutinins about 16 to 17 days postinoculation, which lasted for about 50 days.

When 17-day-old embryonated White Leghorn hen's eggs were inoculated with certain leptospiral serotypes, the newly hatched chicks developed a clinically recognizable disease. In these cases, *Leptospira* could be observed readily in the circulating blood. Inoculation of 28-day-old White Pekin duck embryos with *L. canicola* produced similar results and the hatched ducklings died in a few days. No apparent advantage of duck embryos over chicken embryos could be seen.

Four five-month-old chickens, which had been infected previously as day-old chicks, and two normal adult birds not previously infected were inoculated with a culture of *L. canicola*. None of the six birds developed leptospiremia but one, a bird previously infected as a day-old-chick, did respond to challenge by producing a significant rise in serum agglutinins.

The authors state that although a recognizable disease can be induced in baby chicks, it is extremely doubtful that leptospirosis caused by species of Leptospira pathogenic for mammals would be a natural occurrence in chickens. The use of chick-embryos technic for isolation of pathogenic Leptospira from blood, urine, or tissue suspensions is, however, suggested. Examples of the use of these technics are given in the articles which also include reviews of the literature on similar studies.

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Turkey poults need at least four times as much vitamin A for normal growth as do chicks.

VETERINARY NUTRITION

MORRIS ERDHEIM, D.V.M.
Chicago, Illinois

Antibiotics in Nutrition

Veterinarians have looked upon the inclusion of antibiotics in animal feeds with some apprehension. This feeling is understandable. It suggests promiscuous use of a medicament. The pathologist finds it a disturbing influence when attempting to culture gastrointestinal contents. Some clinicians feel that there has been an increase in the incidence of intestinal mycotic lesions since the use of antibiotics in feed. Despite all this, antibiotics are well established in animal feed formulas, and will no doubt remain as an important ingredient for animal feeds. Therefore, a brief review of the use of antibiotics in feeds may be helpful.

There are two general uses for which antibiotics are included in feeds:

1. High level — for disease treatment. At the present time this refers to the addition of 200 - 500 gm. of antibiotics to a ton of poultry or hog feed. This is fed to sick birds or hogs, and is supposed to control bacterial growth, resulting in recovery of the sick individuals. In viral diseases, this program is used to control secondary invaders.

2. Low level — for nutritional use as a growth stimulant. Nutritionists regard the finding that antibiotics would increase growth and improve feed efficiency as one of the most phenomenal discoveries in the nutrition field.

The manner in which antibiotics work these wonders still is not clearly understood. However, it is fairly well accepted in the field that they reduce intestinal microflora which compete with the host for nutrients in the diet. This exerts a sparing effect on protein and water soluble vitamins by the antibiotic. It also is felt that the antibiotic action controls pathogens which cause secondary infections, even at low levels in the feed. This minimizes subclinical disease in the birds or hogs, permitting them to make more efficient gains.

It has been shown that antibiotics stimulate growth of certain intestinal flora known to synthesize nutrient substances, like fractions of the vitamin B complex. This, in turn, may stimulate the appetite and encourage greater intake of feed, thus increasing growth.

At any rate, we know from some considerable experience in the laboratory and feeding antibiotics under practical conditions, that we can expect an improvement in feed efficiency up to 15%. The more dramatic results are demonstrated where sanitation is poorest. Runts respond even more dramatically. Some growth response almost always is experienced under practical conditions — implying something less than the best in management and sanitation.

Use in Poultry Rations

The antibiotics commonly used for poultry feeds are aureomycin,®[1] terramycin,®[2] and penicillin. Bacitracin may be used in combination with one of the others. The recommended levels are: Aureomycin and terramycin — 10 gm. per ton of feed. Penicillin — 4 gm. per ton of feed. Best results are obtained if the antibiotics are added to the feed of the chick at hatching, and fed throughout its life cycle.

Antibiotics are used primarily in broiler rations. There is still some question about their value in rations for laying birds. Couch reports that at the Texas A. & M. College, Poultry Department records show consistently higher egg production in pens fed antibiotics in the feeds. He explains this on the basis of controlling the "subclinical disease level" existing in the birds.

Use in Hog Rations

Here, as in poultry rations, the antibiotics of choice are aureomycin, terramycin and penicillin. They are effective in dry lot or pasture feeding programs, though greater growth response is obtained under practical dry-lot conditions.

When antibiotics are included in hog feeds at the nutritional level (10-20 gm. per ton of feed) fewer runts are seen in the lots. Moreover, the pigs tend to be more uniform in size within litters.

Use in Cattle

Most work in the use of antibiotics for cattle has been done with calves. In general, aureomycin and terramycin are effective for calves. Penicillin stimulates little or no growth

®[1]Lederle Laboratories Division, Pearl River, N. Y.
®[2]Chas. Pfizer & Co., Brooklyn, N. Y.

response. In calves, 20 mg. of aureomycin per calf per day stimulates growth and reduces the incidence of scours significantly. Rusoff reported that at Louisiana State University this level was raised to 50 mg. with a 20% greater growth response than that of a control group.

Steers appear to make most economical gains when fed 75 mg. of antibiotic daily on a high roughage ration. Initial work along these lines used antibiotic levels which were too high. These caused severe disturbances in the rumen microflora picture. However, at the 75 mg. per head per day level, no such adverse results show up. In many instances, steers on this low level antibiotic intake will experience a ten day to two week "adjustment" period. This means that they go off feed, at least partially, for this length of time. When "adjusted" to the new feeding program, they return to full feed with no trouble.

No definite answer has been presented to explain how the antibiotic functions in ruminants. Further work will have to be done to determine more precisely just how this fits into practical cattle feeding programs. At Iowa State College, feeding dairy cattle antibiotics from birth until their second lactation indicates that while it caused no apparent harm, no worthwhile results were gained. On the other hand, there may very well be room in beef cattle lots for antibiotics if further work shows that improved growth rate at lower feed costs can be expected without detrimental side effects.

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Combined Antibiotics and Sulfonamides

(*Continued from page 443*)

21. Klein, M., and Kimmelman, L. J., The Correlation between the Inhibition of Drug Resistance and Synergism in Streptomycin and Penicillin. *Jour. Bact.*, 54:363 (Sept.), 1947.

22. Klein, M., and Kalter, S. S., The Combined Action of Penicillin and the Sulfonamides *in Vitro*: The Nature of the Reaction. *Jour. Bact.*, 51:95 (Jan.), 1946.

23. Dowling, H. F., Lepper, M. H., and Jackson, G. G., When Should Antibiotics be Used in Combination? *Jour. Am. Med. Assn.*, 151:813 (Mar. 7), 1953.

24. Bryan, C. C., LaBranche, V. P., and Drury, A. R., Penicillin-Streptomycin Bougies in the Treatment of Acute Infectious Mastitis. *N. Am. Vet.*, 31:20 (Jan.), 1950.

25. Hancock, R. M., Personal communication.

26. Shideler, R. K., Personal communication.

Natural Withdrawal of Testicles in Dogs

During the course of a study in nutrition, two male and two female Redbone Coonhounds were used. They were weighed and photographed once a week. The pups were born July 26, 1954. On October 15th, I was examining the dogs during weighing and found that the heaviest was a monorchid, the other male was then examined and found to be normal.

The heavier male was such an outstanding specimen that we were most disturbed by the defect. The dog was examined two months later, at which time descent of the hidden gland had occurred. Just when it descended we do not know. The other dog was examined and found to be normal. All glands were normal in size considering the age of the dogs. The matter was forgotten. Both animals grew rapidly and became kennel dogs.

Imagine our amazement when on June 23rd, 1955, we were readying both dogs for show and noted that the scrotum of the larger appeared small. Palpation revealed only one testicle. The litter mate was then examined and found to possess only one gland in the scrotum. By careful palpation the missing organs were located to one side of, but not in, the scrotum of each.

In some spontaneous manner both dogs withdrew one testicle back from the scrotum, the other remaining in the normal position.—*Leon F. Whitney, D.V.M.*

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The U. S. Department of Agriculture places the annual average loss of milk due to ketosis at 116,712,900,000 lb., valued at $4,228,375,000. Death loss due to this metabolic disease is estimated to be $5,000,000. annually.

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Makers of Gaines Dog Food and the recently announced Gaines canned dog food, are introducing a new product in the form of biscuits having a variety of flavors. The biscuits can be fed, according to spokesman for the manufacturers, as a complete nourishing meal, or as a reward in training activities.

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If activity continues at the present rate, it is predicted that 15,000,000 Brucella blood-agglutination tests will be conducted in the United States during 1955.